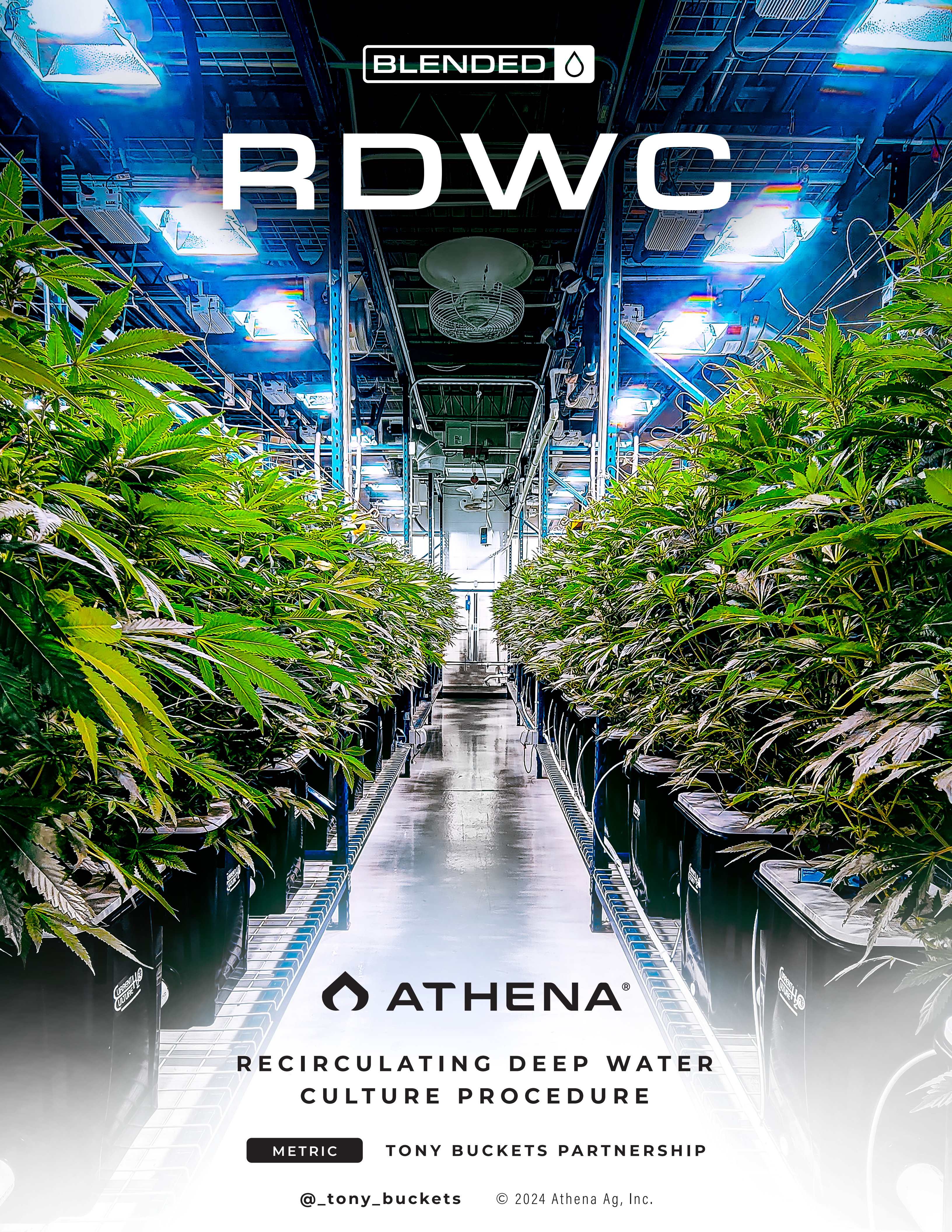

BLENDED

RDWC

ATHENA®

RECIRCULATING DEEP WATER CULTURE PROCEDURE

METRIC TONY BUCKETS PARTNERSHIP

@_tony_buckets © 2024 Athena Ag, Inc.

For The Culture™

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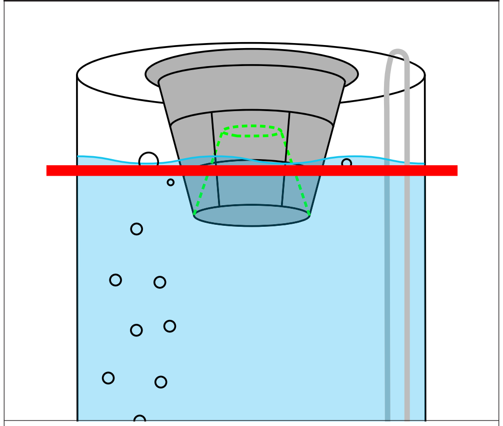
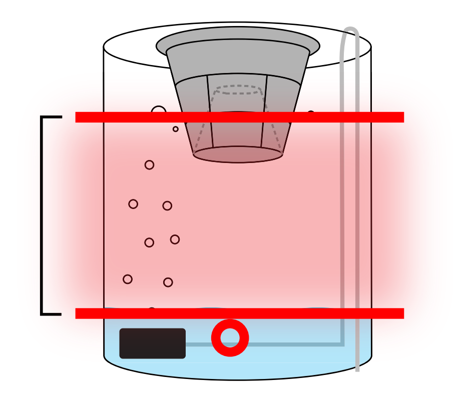
RDWC DEFINITIONS

🟥 OPERATING VOLUME



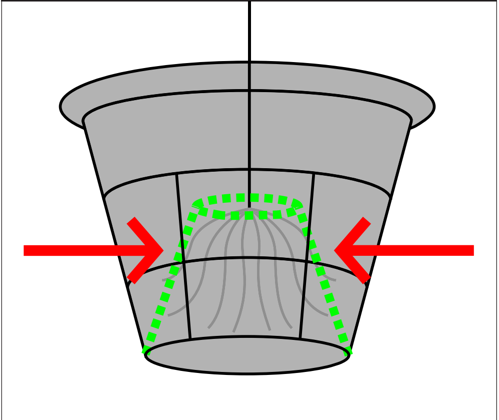
🟥 Solution level when 6.5 mm below the 🟩 Planting Deck.

CHANGEOUT VOLUME



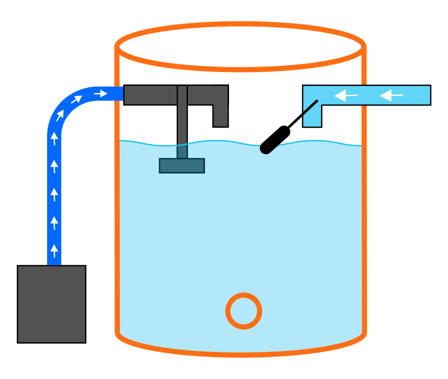
Difference of 🟥 **Operating Volume** and liquid left when drained to the top of the ○ bulkhead nut.

🟩 PLANTING DECK



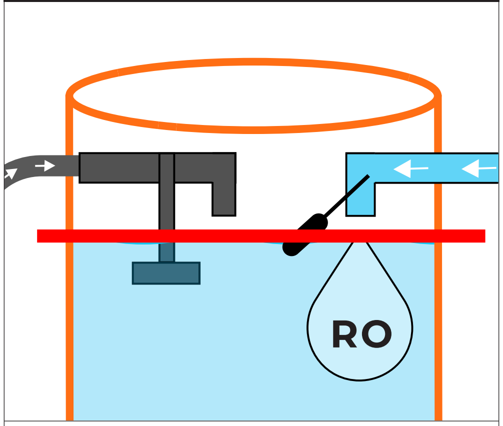
Raised portion of the net pot designed to seat the basal stem of a rooted clone or rockwool cube.

🟧 CONTROL BUCKET



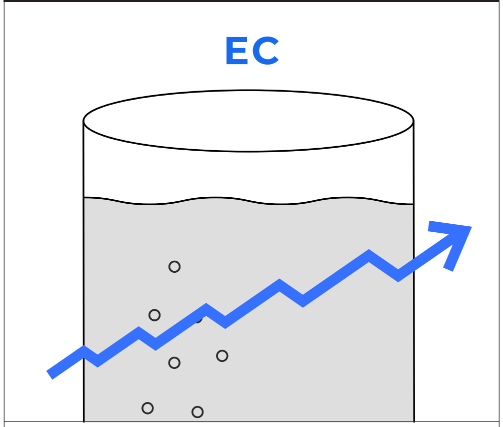
Plant-free bucket for circulation control, volume, temperature control, EC, and pH.

TOP OFF



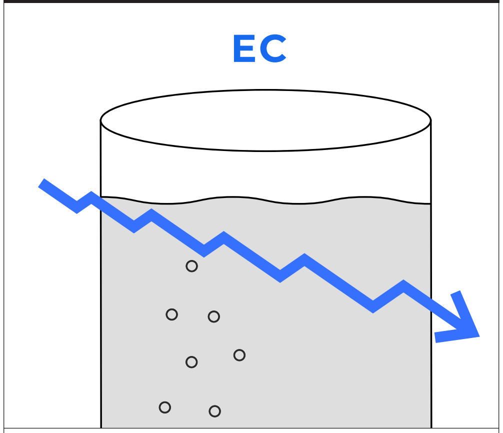
Continuous addition of fresh RO water via pressured manifold or reservoir.

FEATHERING UP



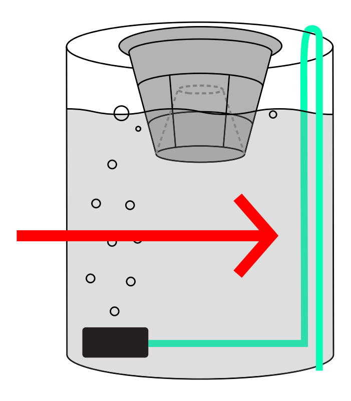
The gentle and gradual increase of EC over time.

EATING DOWN



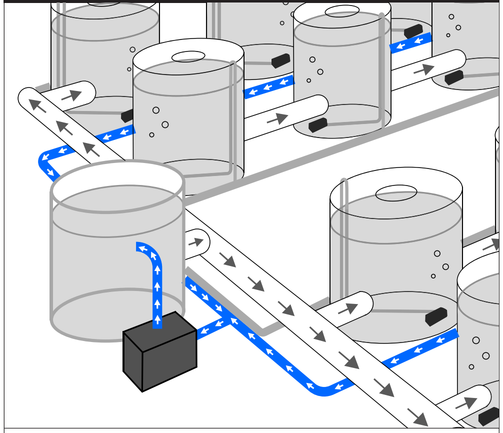
Reducing EC by letting plants consume nutrients without replenishing; maintain Top Off.

🟩 AIR MANIFOLD



Connected to an air pump/ blower. Distributes air to all grow sites.

🟦 RE-CIRCULATING LINE



Line returning solution to the control bucket for recirculation.

RDWC OVERVIEW

What is RDWC?

Recirculating Deep Water Culture (RDWC) is a hydroponic growing system where plant roots are submerged in a nutrient-rich, oxygenated water solution. The system consists of multiple plant sites connected to a central reservoir (control bucket). The water cycles continuously through the system, returning to the control bucket, ensuring consistent and optimal EC, pH, and temperature for healthy plant growth.

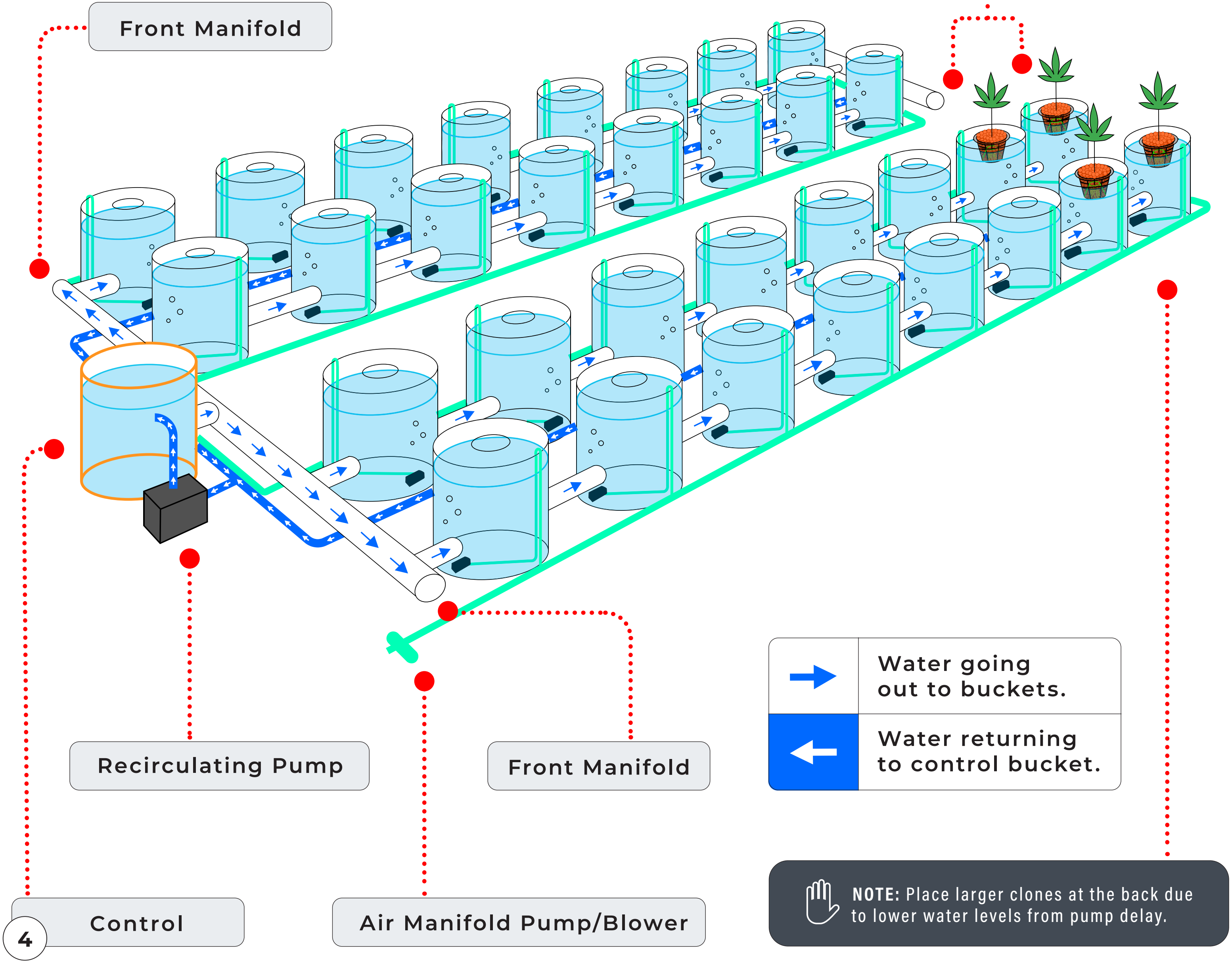
Why RDWC?

NO WATERING

MORE HARVESTS

BIGGER YIELDS

🟦	Recirculating Line	🟧	Control bucket
🟩	Air Manifold	⬛	Air Stone



Rear Manifolds

Front Manifold

Recirculating Pump

Front Manifold

Control

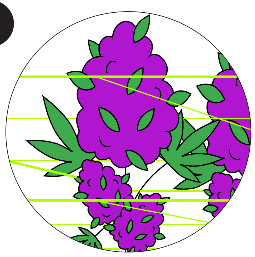
Air Manifold Pump/Blower

→	Water going out to buckets.
←	Water returning to control bucket.

NOTE: Place larger clones at the back due to lower water levels from pump delay.

RDWC EXPECTATIONS

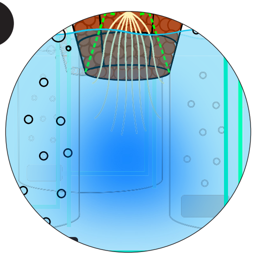
①



ROBUST GROWTH

Vigorous plant growth with lush foliage.

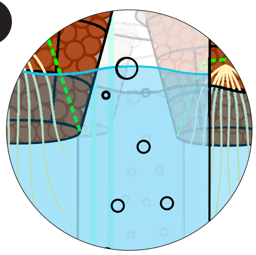
②



NUTRIENT STABILITY

Minimal to no nutrient deficiencies or leaf discoloration.

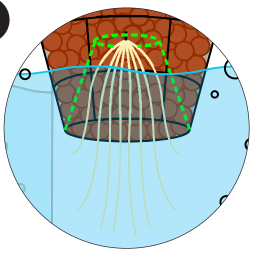
③



OXYGENATION CONTROL

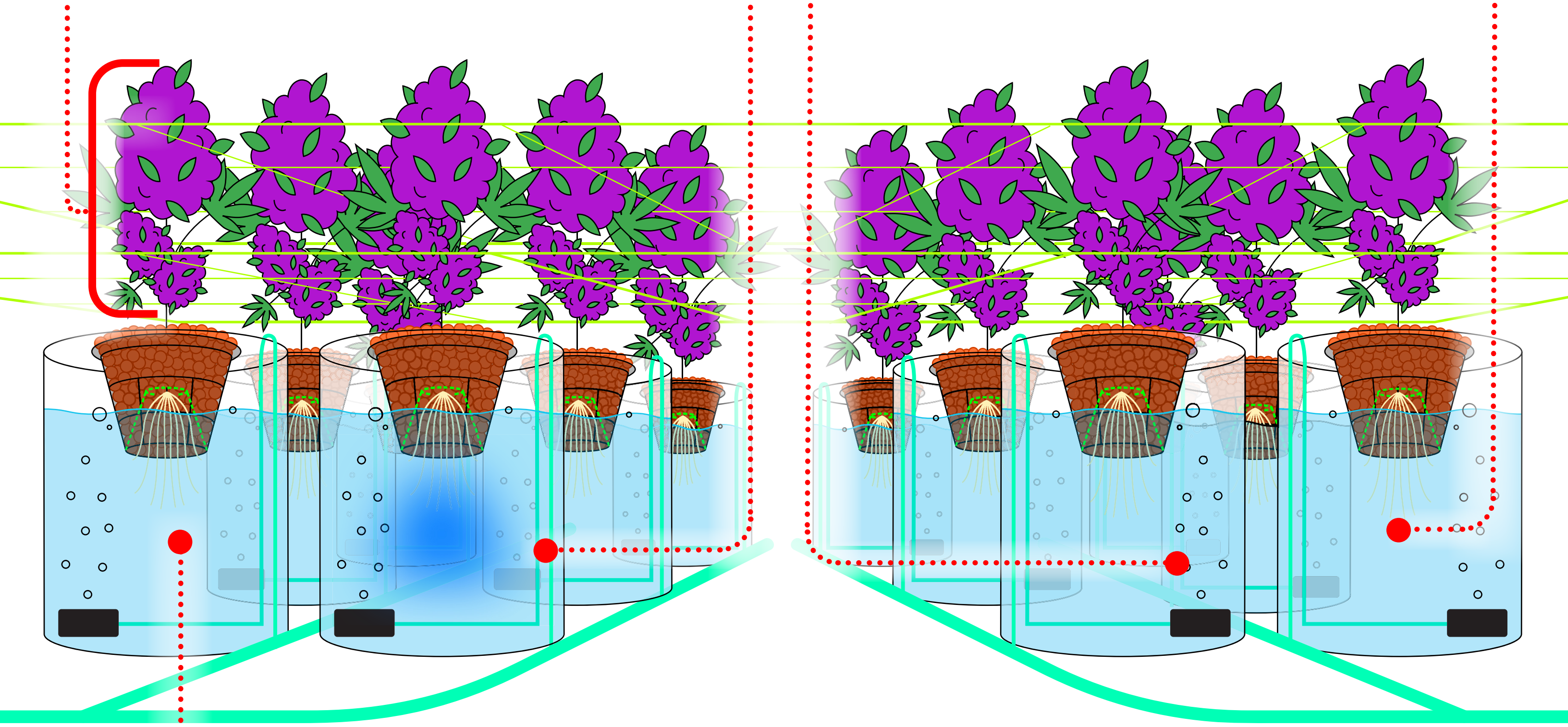
Accurate ORP, dissolved oxygen, and active bubbling.

④



STRONG ROOTS

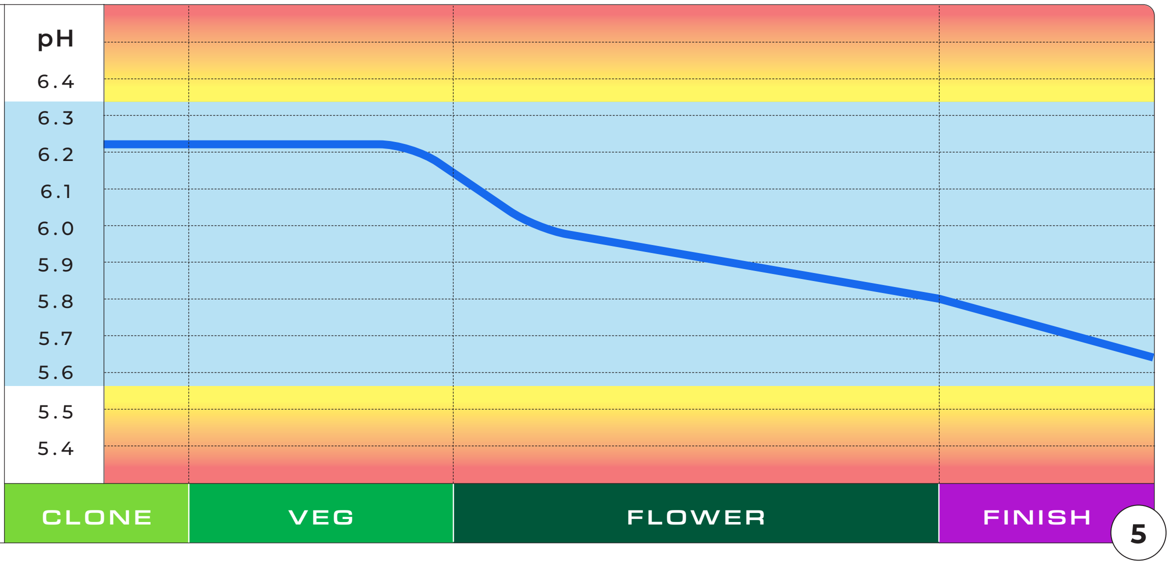
Strong root development and white, healthy roots.



⑤

PREDICTABLE PH

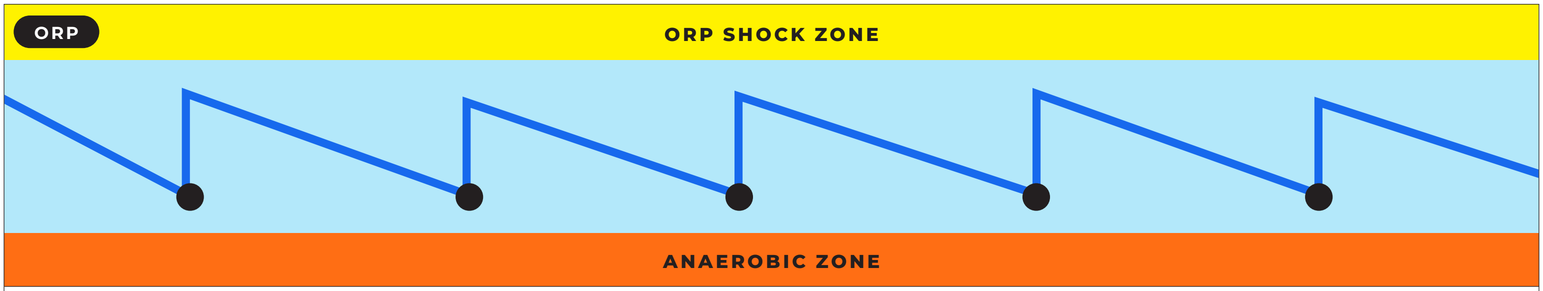
If pH fluctuates outside of the safe zone, problems can occur. pH should be monitored and strictly maintained.



━	pH
🟦	Safe Zone
🟧	Danger Zone

RDWC WATER IMPORTANCE

Water quality is crucial in RDWC systems for healthy plant growth. Reverse osmosis (RO) water removes impurities like chlorine, heavy metals, and pathogens, ensuring a clean baseline for precise nutrient control. Maintaining healthy water prevents harmful buildup, supports oxygenation, and promotes a healthy root environment, leading to vigorous growth and maximum yield.

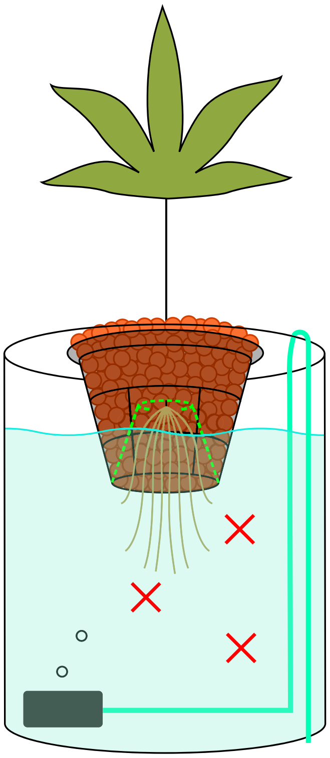


● Shot of Cleanse during addback

— ORP fluctuation over time

☒ **ANAEROBIC**

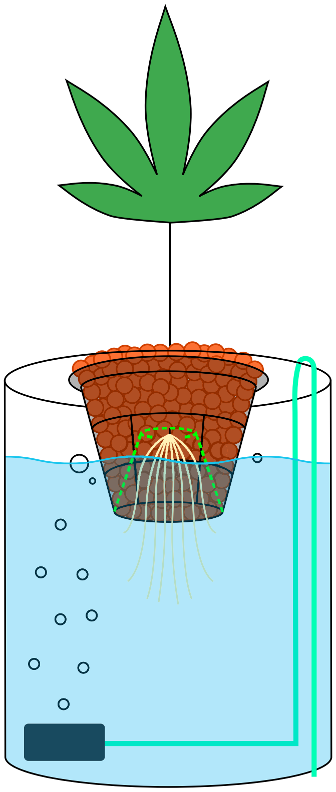
Anaerobic conditions occur with reduced ORP levels in the water, leading to the growth of harmful pathogens that can cause root rot and other issues.



SMELL: Putrid

✓ **SAFE**

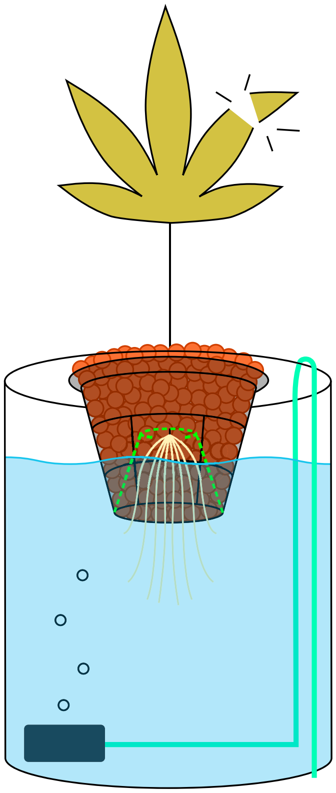
Maintaining proper ORP levels keeps water clean and encourages optimal root health and plant growth.



SMELL: Fresh Bean Sprouts

☒ **ORP SHOCK**

High ORP levels in RDWC can cause shock to the root system. This is caused by a highly oxidized environment that impacts the root's ability to exchange nutrients.



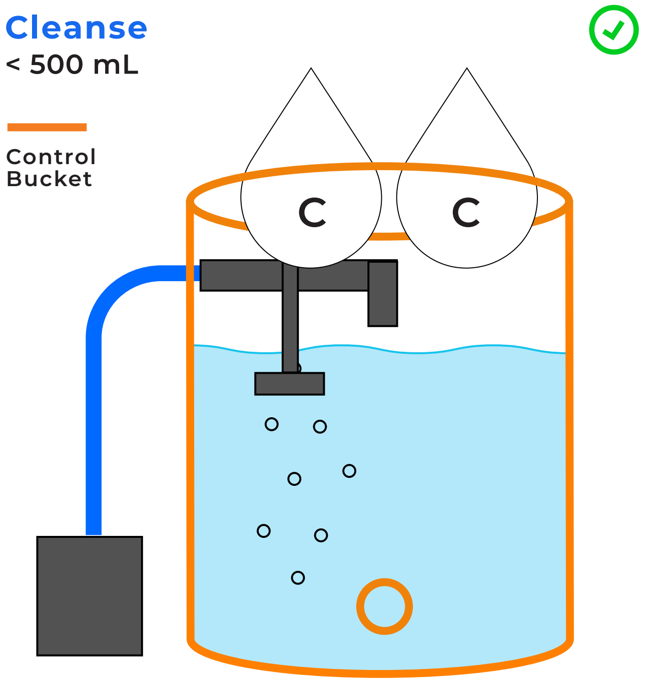
SMELL: Chlorine

Athena® Cleanse	**mL/10 L**	
Initial Mix:	10.6	
Changeouts:	10.6	
Veg W1:	0.4	per day
Veg W2-3:	0.5	per day
Veg W4:	0.7	per day
Flower	2.1	per day
Finish	2.1	per day

NOTE: Young plants do not eat/drink at the same rate of established plants. The amount of Cleanse added to the system should gently increase over the weeks to account for new RO water being added to the system.

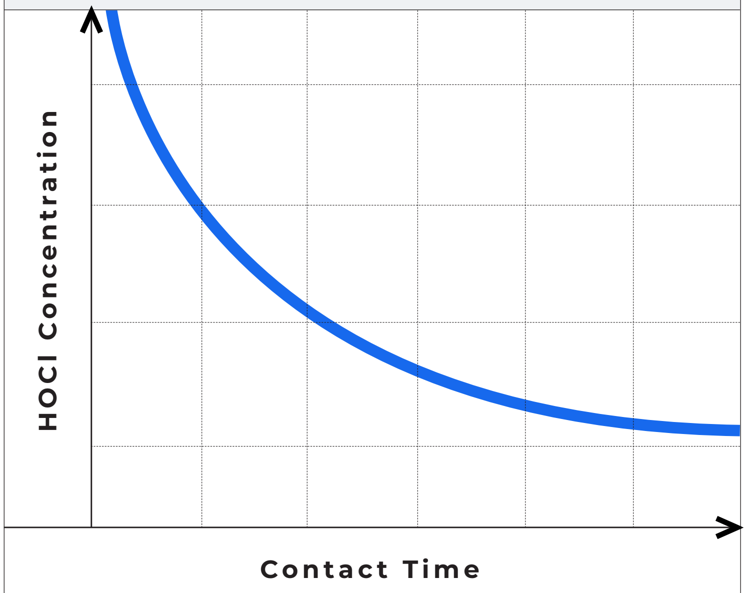
ORP SHOCK

WARNING: HYPOCHLOROUS ACID IS SAFE AND NON-DAMAGING TO PLANT TISSUE. HOWEVER, OVERUSE IN A RDWC SYSTEM CAN CREATE A HIGHLY OXIDIZED ENVIRONMENT THAT THAT REDUCES NUTRIENT UPTAKE. RDWC SYSTEMS REQUIRE MUCH LOWER ORP LEVELS THAN OTHER GROWING METHODS DUE TO THE EXTENDED CONTACT TIME AND THE VOLUME OF SUBSTRATE. ORP SHOCK APPEARS AS A NUTRIENT DEFICIENCY--YELLOWING OR DRY, CRUSTY FOLIAGE.



Athena® Cleanse is okay to pour into the control bucket in increments of 500 mL or less and can be added to the system with the nutrient addback or by itself.

Athena® Cleanse
Concentration & Contact Time



Higher concentrations require less contact time. For longer contact times like in RDWC, a lower concentration is required for optimal performance.

Cleanse
FOR CLEAN SYSTEMS
BLENDED
ATHENA
Cleanse
ATHENA

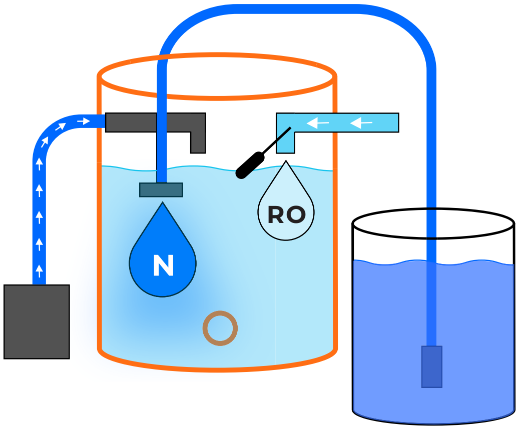
Athena® Cleanse

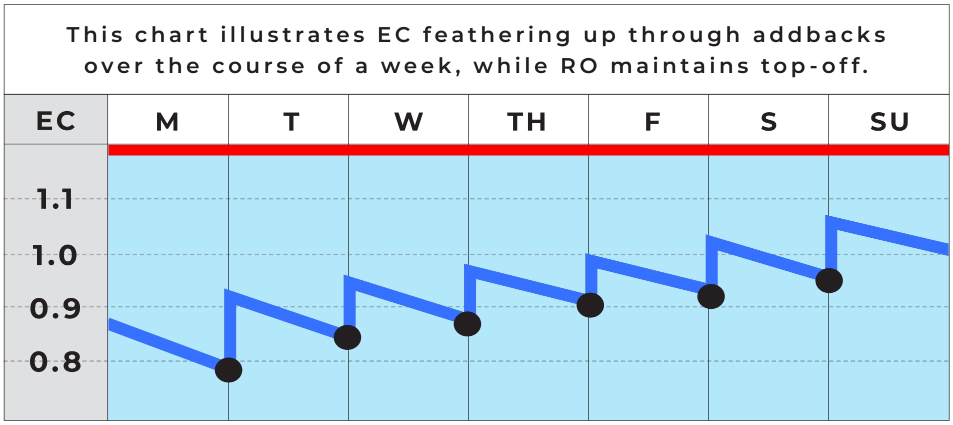
For Clean Systems

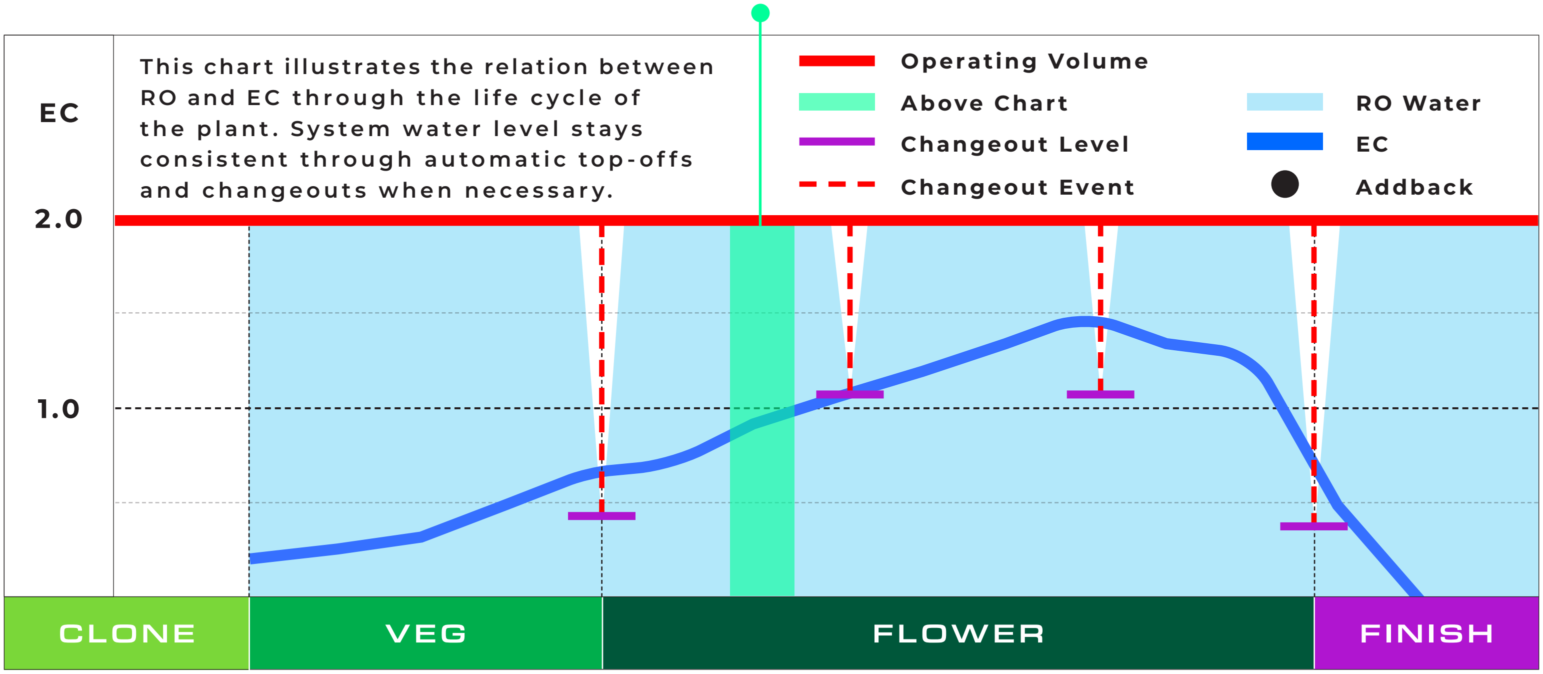
Athena® Cleanse raises the Oxidation Reduction Potential (ORP) of water, increasing its ability to oxidize and reduce substances like mineral scale and organic matter.

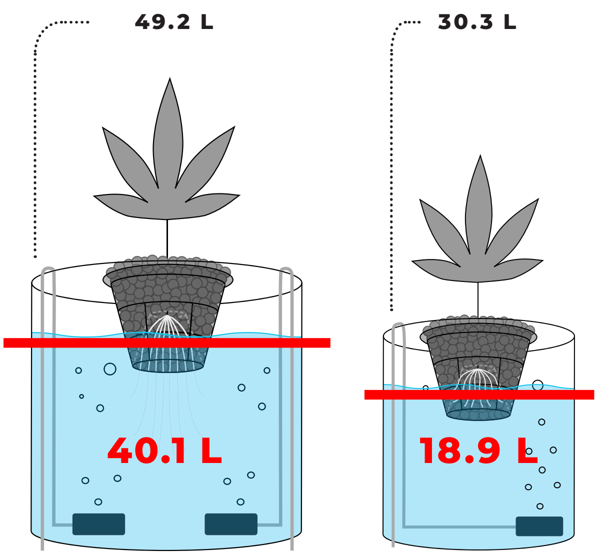
RDWC ADDBACKS

Addbacks refer to adding nutrients back into the system through the control bucket and are used to replenish the EC in the solution. In a DWC system, EC is constantly depleted by topping off the water and by plant consumption, so it is essential to replenish with nutrient addbacks.




This chart illustrates EC feathering up through addbacks over the course of a week, while RO maintains top-off.


This chart illustrates the relation between RO and EC through the life cycle of the plant. System water level stays consistent through automatic top-offs and changeouts when necessary.



RDWC OPERATING VOLUME

🟥 Operating Volume
should be approximately:

40.1 L per 49.2 L module	**18.9 L** per 30.3 L module

⚠ **WARNING:** FAILING TO ACCOUNT FOR THE TOTAL VOLUME OF THE RDWC SYSTEM WHEN ADDING BACK NUTRIENTS CAN LEAD TO IMPROPER CONCENTRATIONS.

RDWC ADDBACKS

To increase the EC value of your RDWC system, follow this procedure.

The 2 Key Addback Variables:

- **Target EC**
- **Nutrient Recipe**

ADDBACK EC CALCULATOR

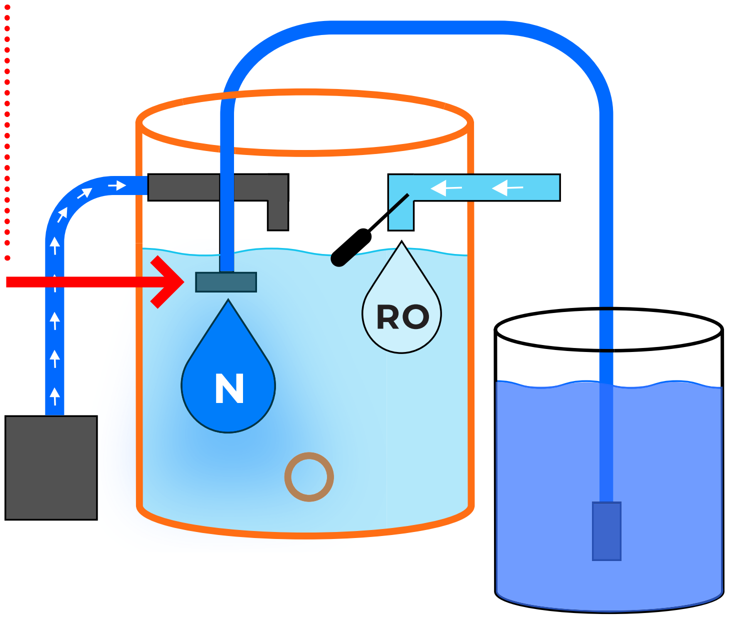
Use this calculator to determine precise nutrient amounts. Input Stage, Week, System EC, Target EC and Operating Volume.

ADDBACK EC CALCULATION

1 TARGET EC	Determine what week you are in and your target EC.
2 SYSTEM EC	Make sure system is at Operating Volume and check current EC.
3 ADDBACK EC	Target EC - Actual EC = Addback EC
4 RECIPE	Use the calculator to get the volume of each nutrient.

Do not start adding nutrients into your control bucket until you are at 75% of operating volume.

If using an addback kit, the nutrients will not start flowing until the lower portion of the addback kit has been submerged.



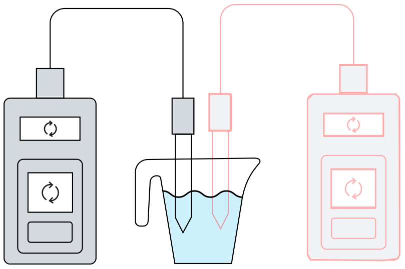
NOTE: All nutrient parts are mixed into one 5 gallon addback tank. Do not dump into the control bucket, nutrients must be added through an addback kit.

WARNING: DO NOT ADD MORE THAN 500ML OF ANY ONE PART THROUGH A SINGLE ADDBACK TANK. IF YOUR ADDBACK REQUIRES ANY MORE THAN 500ML PER PART, USE MULTIPLE BUCKETS.

ADDBACK PROCEDURE

1 FILL	Fill 18.9 L bucket to 90% with RO water. (small addbacks, use 50%)
2 ADD	Add required nutrients to the 18.9 L bucket one at a time, maintaining the mixing order.
3 STIR	Stir between adding each nutrient.
4 PUMP	Slowly pump the mix into your system using an addback kit.
5 ADJUST	Adjust the discharge valve to slowly dilute for 25 minutes.
6 WAIT	Allow system to circulate for 30 minutes.
7 MONITOR	Continuously monitor control bucket during discharge. If EC swings, slow down or dilute.

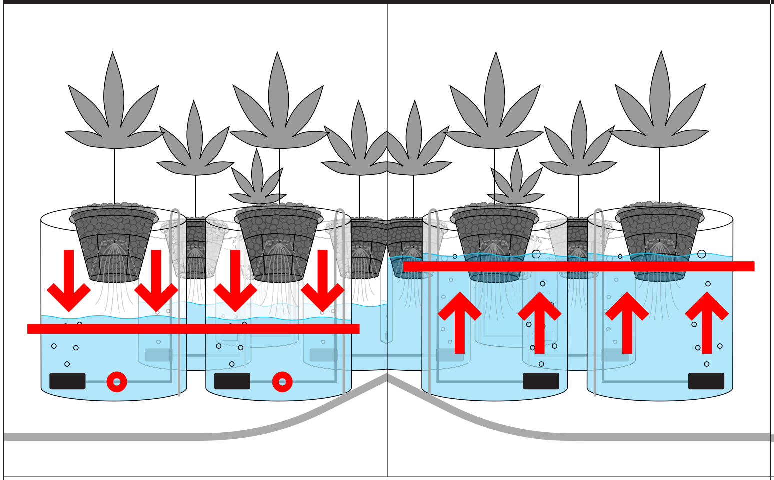
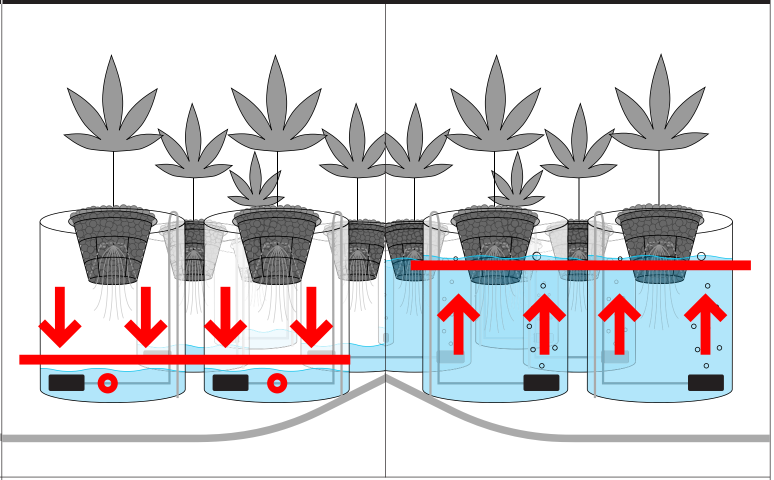
PRO TIP: Verify system pH and EC with a second meter. Adjust pH if needed using the Addback Procedure.



CALIBRATE

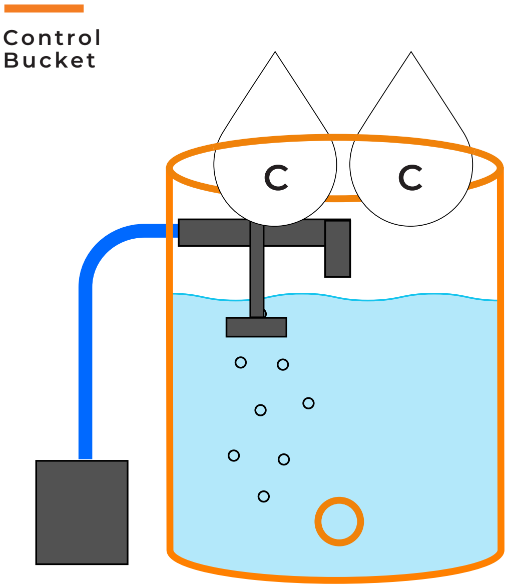
Clean and calibrate your EC/pH probe.

Maintaining the right nutrient balance, pH, and EC levels is crucial for plant health in an RDWC system. Regular changeouts—either partial or full—are essential to address imbalances and prevent contamination. This guide will help you determine when to perform each type of changeout and provide step-by-step instructions to keep your system efficient and your plants thriving.

PARTIAL CHANGEOUT	FULL CHANGEOUT
	
Replacing 20-50% of the nutrient solution to correct minor imbalances and adjust water levels while keeping the system stable.	Draining down to the top of the bulkhead fitting and replacing the entire nutrient solution to address significant issues, such as major imbalances and reset the system.

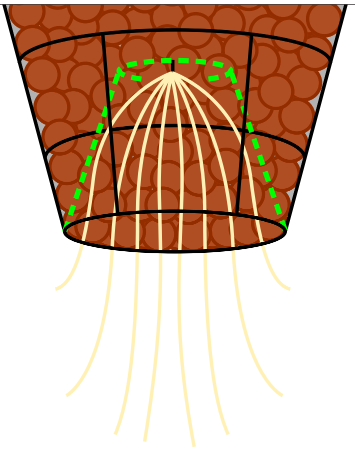
CHANGEOUT TRIGGERS	
CONDITION	**ACTION**
3 week Veg time	Partial Changeout
pH fluctuating despite correction and full changeout this week.	Partial Changeout
Plants have drastically slowed eating despite stable parameters.	Partial Changeout
pH is rising/dropping more than allowable limits.	Full Changeout
pH correction requires a steadily increased amount of buffer.	Full Changeout
Plants slow nutrient uptake and needs more pH buffer.	Full Changeout
Parameters fluctuated beyond limits due to operator error.	Full Changeout
Post defoliation or between days 26-32.	Full Changeout
10-14 days before harvest.	Full Changeout
Flipping to Bloom after a 4 week or greater veg time.	Full Changeout

Cleanse 10.6 mL / 10 L
< 500 mL



NOTE: For partial and full changeouts, always add 10.6 mL / 10 L Cleanse. (Changeout Volume).

Changeout procedures are vital for maintaining optimal RDWC system conditions. This section includes a tool for resetting your system and offers recommended timings and methods. However, the final decision on when and how to perform changeouts is up to the grower. Use these guidelines as a starting point and adjust based on your system's needs.



Changeouts should be performed quickly and effectively.

⚠ **WARNING:** MINIMIZE THE TIME ROOTS ARE EXPOSED TO AIR TO PREVENT STRESS AND DAMAGE.

NOTE: Consistent monitoring and adjusting of pH and EC levels during these changeouts will ensure optimal nutrient availability and prevent buildup of harmful residues.

⚠ **WARNING:** DURING NUTRIENT SOLUTION CHANGEOUTS, ENSURE THAT THE SYSTEM IS POWERED OFF TO AVOID ELECTRICAL HAZARDS.

CHANGEOUT PROCEDURE

1 **DETERMINE**	Determine what kind of changeout you need.
2 **VOLUME**	Determine volume of water.
3 **RO**	Ensure there is enough RO water to fill the system to operating volume.
4 **DRAIN**	Quickly drain your system.
5 **REFILL**	Immediately refill with RO.
6 **ADDBACK**	Add back nutrients using the Addback Procedure.
7 **MONITOR**	Check pH, EC, and water levels. Adjust as needed.

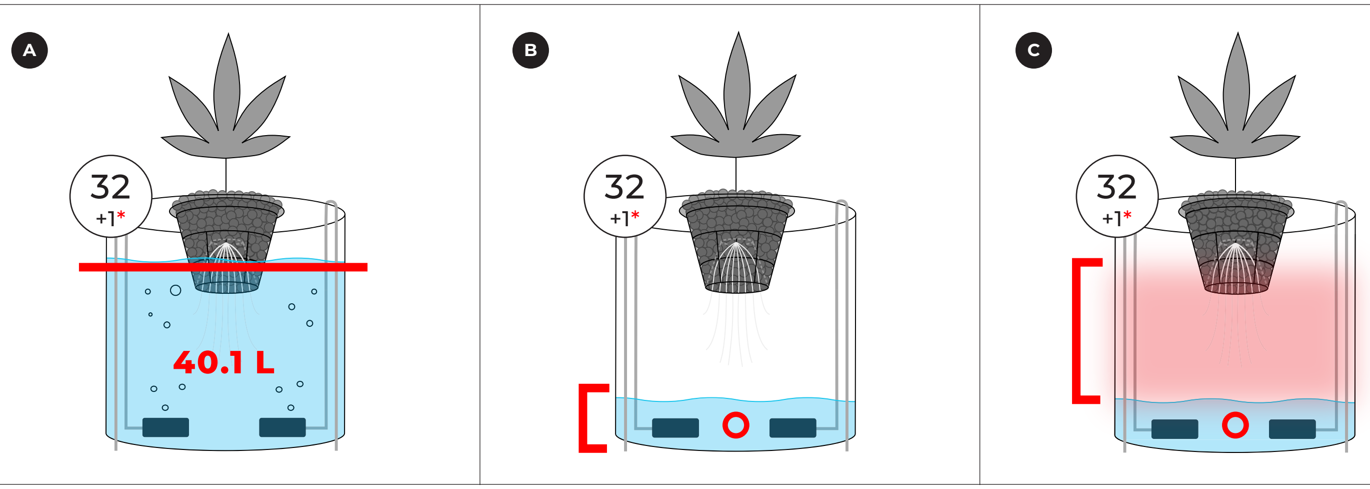
CHANGEOUT CALCULATION

This calculation shows how much nutrient solution to replace for optimal RDWC system conditions. Knowing the operating and left-over volumes ensures accurate changeouts.

Example Calculation for a 32-site system:

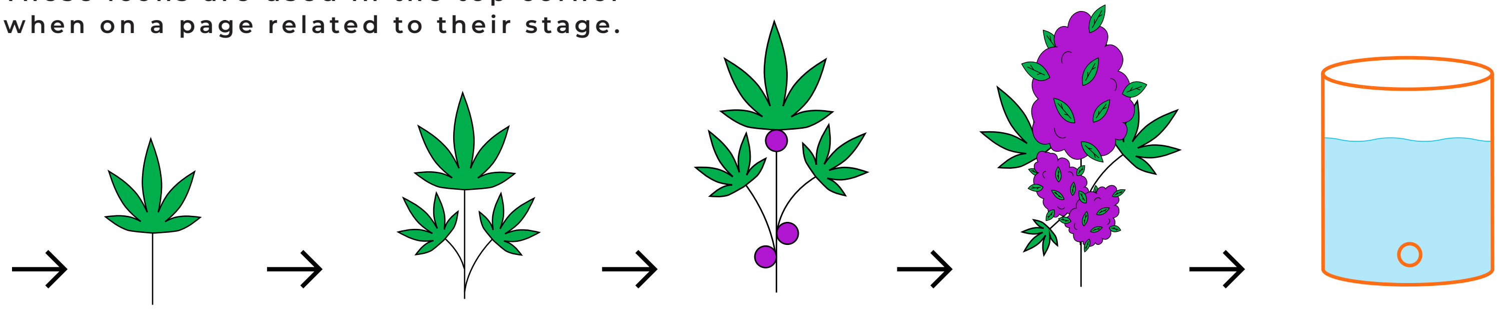
A. Operating volume: 33 modules × 40.1 L = 1325 L
B. Left-over volume: 33 modules × 11.4 L = 375 L
C. Change-out volume: 1325 L - 375 L = 946 L

*Be sure to include the control bucket in all volume calculations.



RDWC REFERENCE

These icons are used in the top corner when on a page related to their stage.



→ CLONE → VEG → FLOWER → FINISH → CLEAN

FLIP

C
CLEANSE

RO
RO WATER

PH
PH CHANGE

N
VEG NUTES

N
BLOOM NUTES

NET POT

EXPANDED CLAY

ROCKWOOL

ADDBACK TANK

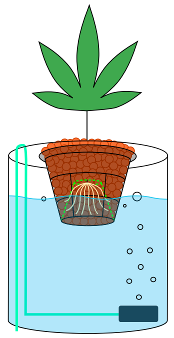
BAG

DRUM

DETERMINE SYSTEM SIZE

VEG-IN-PLACE

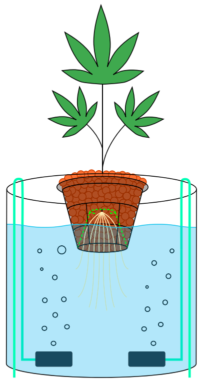
30.3 L ONLY
<3 Week Veg



VEG + FLOWER

MOMS

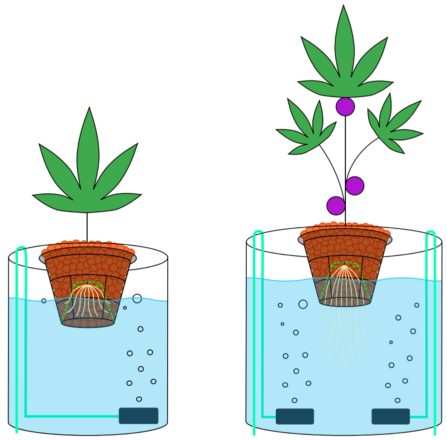
49.2 L ONLY
Perpetual Veg



VEG

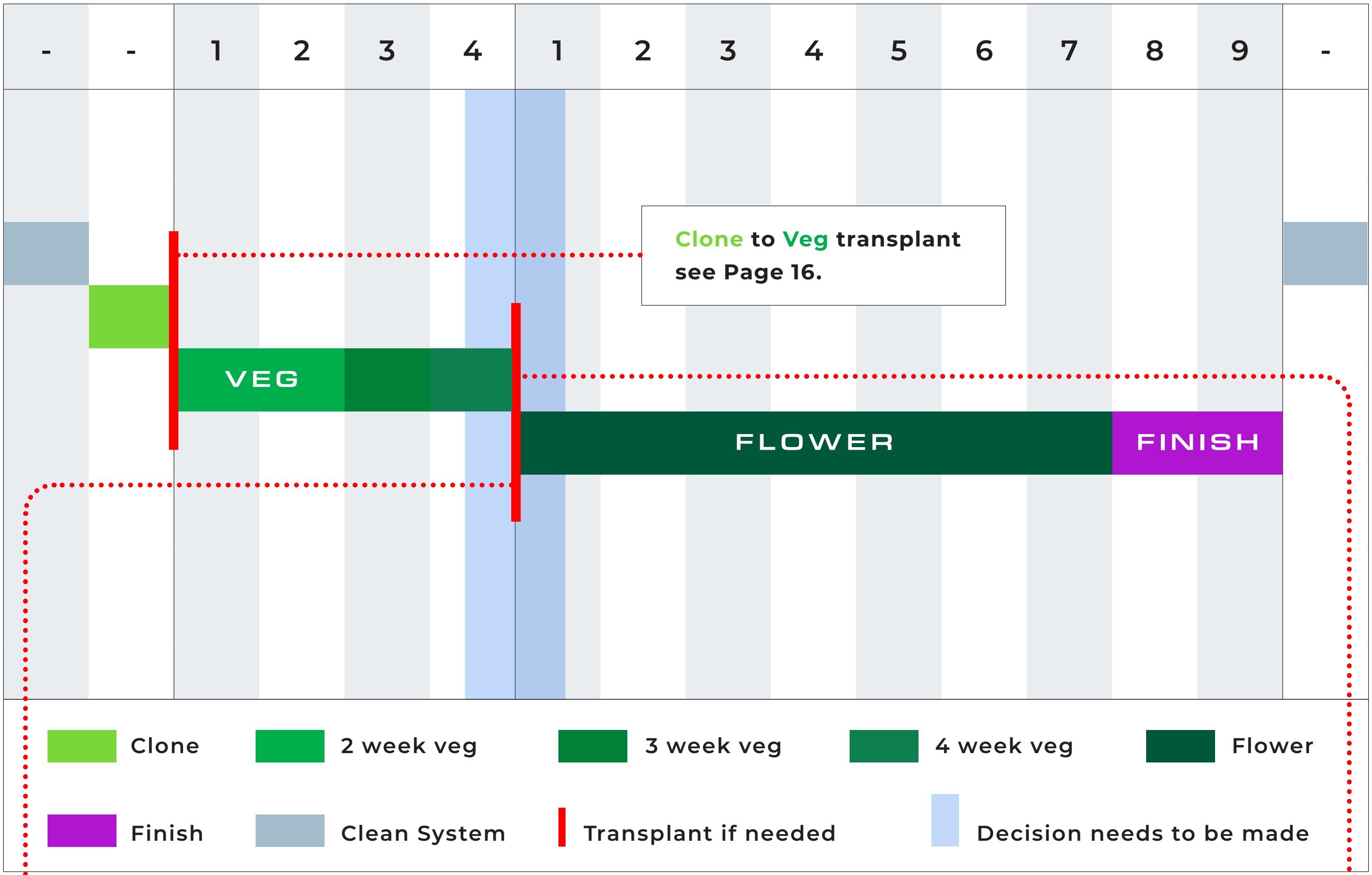
TRANSPLANT

30.3 L + 49.2 L
>3 Week Veg



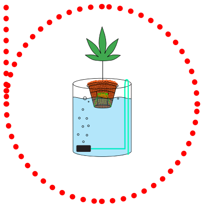
VEG FLOWER

RDWC TIMELINE



Clone to **Veg** transplant
see Page 16.

VEG TO FLOWER FLIP



1 System

VEG-IN-PLACE

Adding nutrients back to the existing system rather than creating an entirely new nutrient solution.

VEG + FLOWER **SAME ROOM**

SMALL OR LARGE FACILITIES

REDUCED STRESS

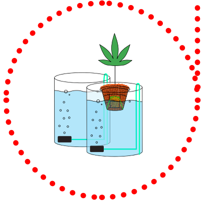
LESS LABOR

3-4 TURNS PER YEAR

Page: 18

TRANSPLANT

Moving the plant to a new system and creating a fresh nutrient solution.



2+ Systems

VEG + FLOWER **DIFFERENT ROOM**

MORE TURNS

UTILIZE SPACE

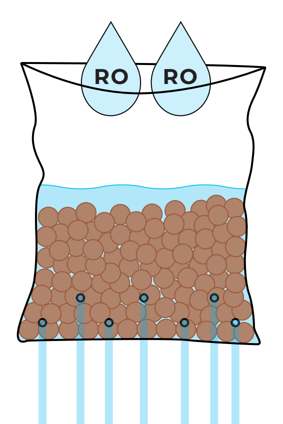
CONTROL ENVIRONMENT

5-6 TURNS PER YEAR

Page: 19

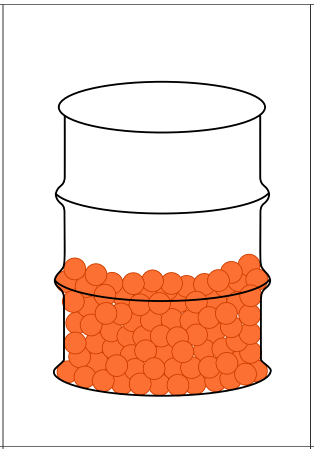
RDWC SYSTEM SETUP

1 PREPARE EXPANDED CLAY/MEDIA



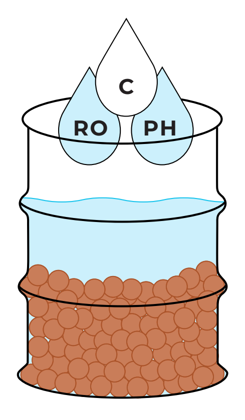
1A RINSE

Poke holes in the bottom of the expanded clay bag and rinse thoroughly with RO water.



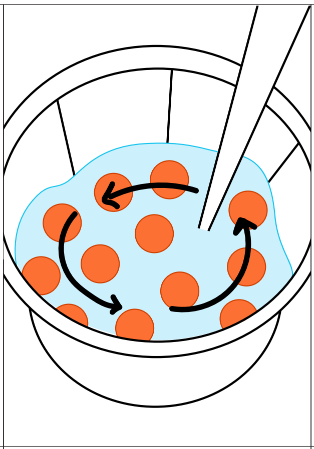
1B TRANSFER

Transfer the expanded clay into a clean 121-liter bin.



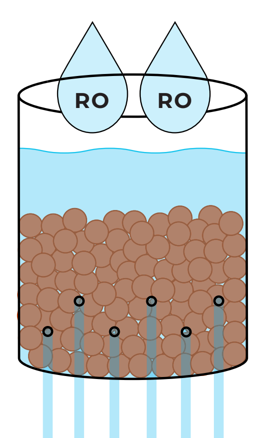
1C FILL

Fill the bin to ¾ of its volume with RO water, then add 50 mL of pH down and 100 mL of Cleanse.



1D STIR

Stir the contents to ensure even distribution.



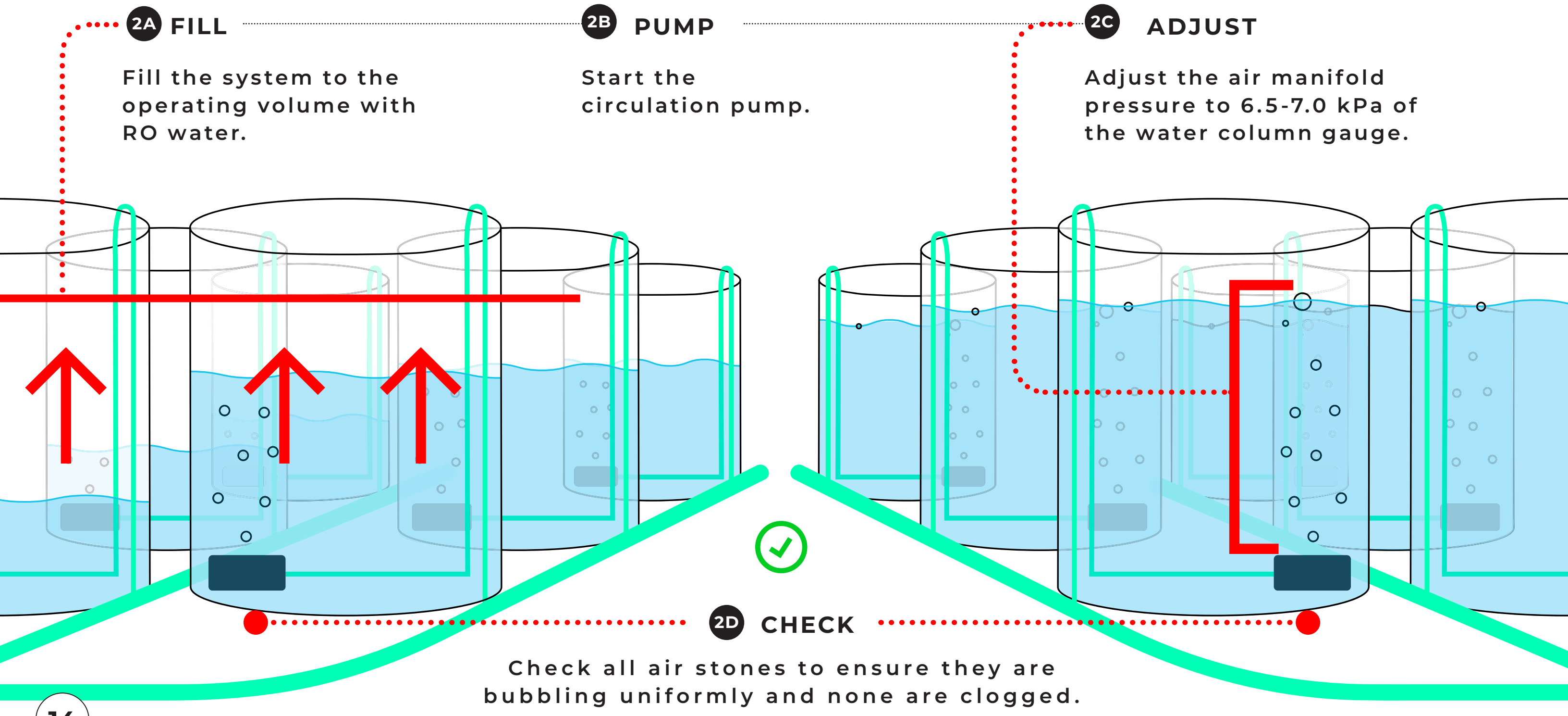
1E RINSE

Transfer clay into another bin with holes and rinse again with RO water.

2 FILL THE SYSTEM

WARNING: DO NOT TRANSPLANT CLONES INTO A SYSTEM COLDER THAN 18.9° C. KEEP IN MIND THAT PH FLUCTUATES WITH TEMPERATURE.

NOTE: Air manifold pressure is measured in Inches of Water Column. Be aware that system volume dictates the pressure.



2A FILL

Fill the system to the operating volume with RO water.

2B PUMP

Start the circulation pump.

2C ADJUST

Adjust the air manifold pressure to 6.5-7.0 kPa of the water column gauge.

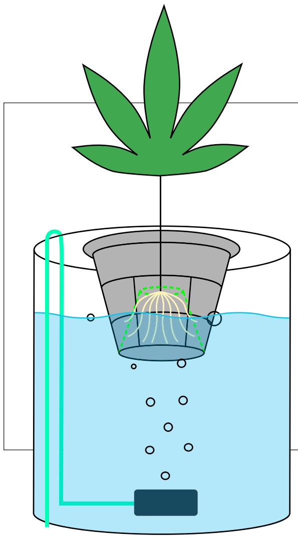
2D CHECK

Check all air stones to ensure they are bubbling uniformly and none are clogged.

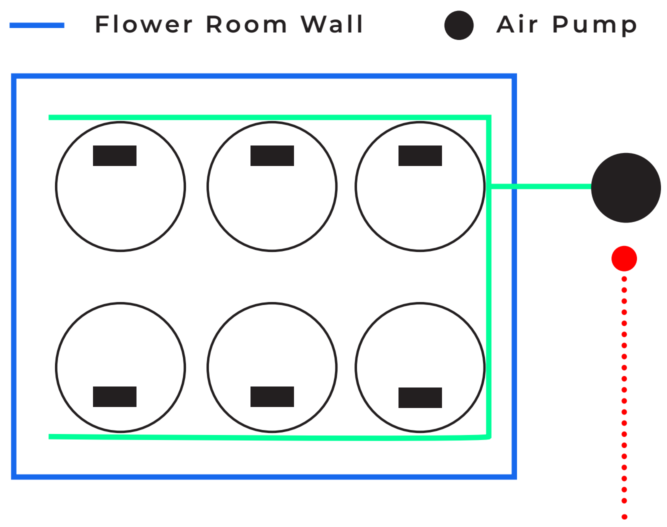
RDWC AIR STONES / AIR PUMPS

Air stones are essential because, without them, the plant would deplete the oxygen in the water, leading to poor water quality. The air pump ensures a constant flow of oxygen, maintaining a healthy environment for the plant. Only one standard 5 x 5 cm medium sized round air stone is needed per 30.3 L bucket. Larger than 49.2 L buckets may require additional air stones, taking shape and volume into consideration.

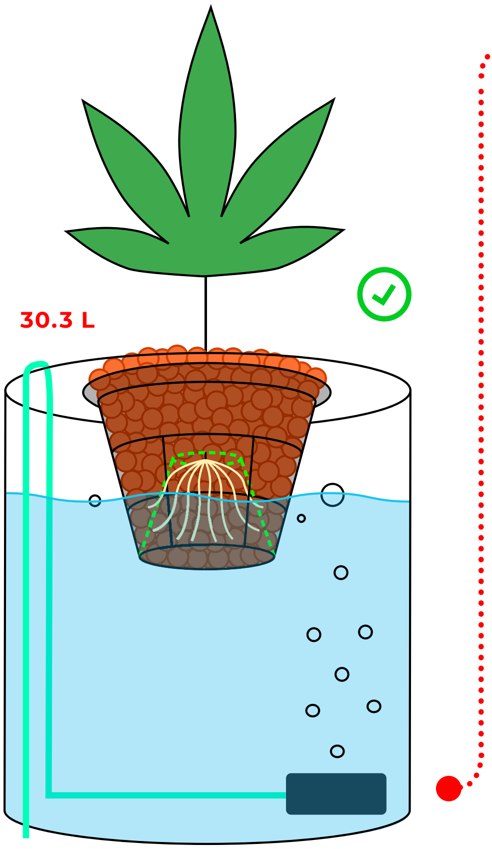
⚠ **WARNING:** ALITA BRAND AIR PUMPS OR SWEETWATER BLOWERS ARE RECOMMENDED TO PRESSURE YOUR AIR MANIFOLD. BLUE DIAMOND BRAND AIR PUMPS SHOULD BE STRICTLY AVOIDED.

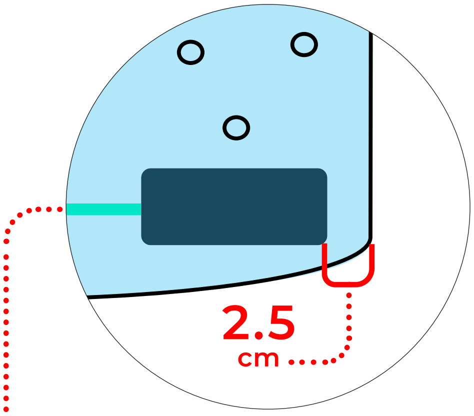


Air stones should NEVER sit directly beneath the net pot. Too much turbidity can cause severe damage to new roots.

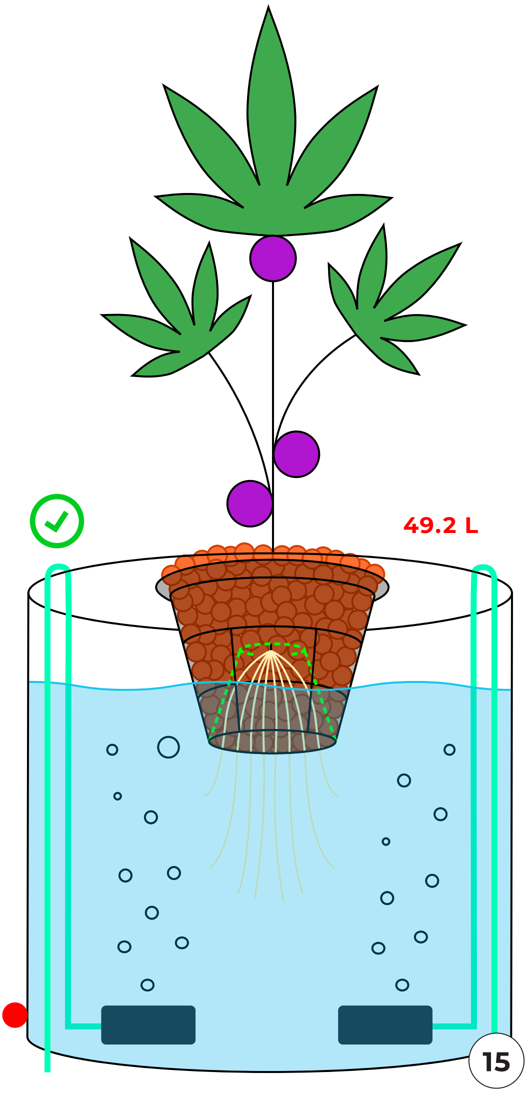


Air pumps and blowers should be placed outside the flower room if the room is enriched with CO2.





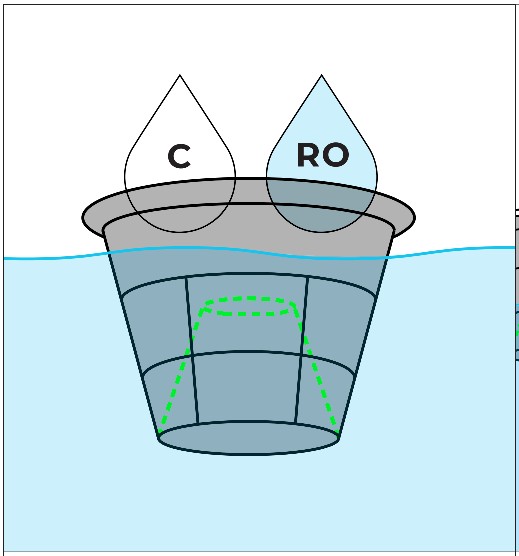
Air stones should sit about 2.5 cm from the side of the bucket.



Air stones should be submerged at the bottom of the bucket.

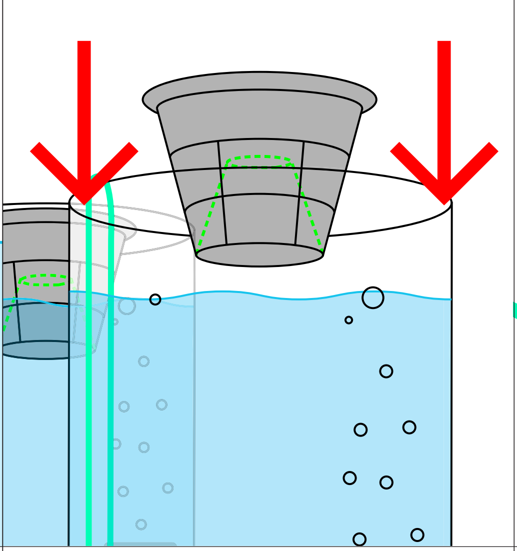
③ SANITIZE NET POTS

NOTE: When viewed from the side, the water should just bubble over the structural ring directly beneath the planting deck.



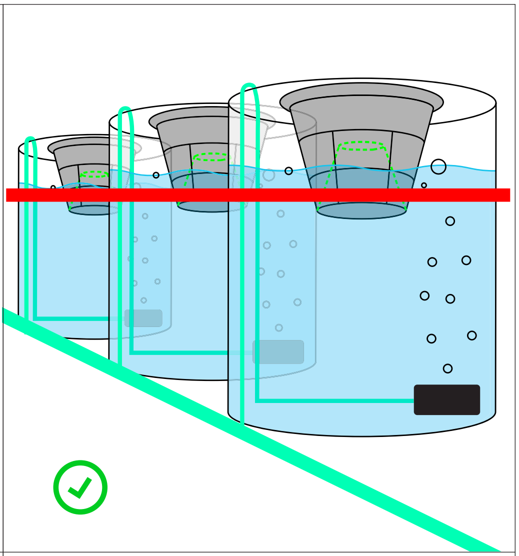
3A DUNK

Dunk net pots in a solution of RO water and 26.4 mL/10 L of Cleanse to remove any factory dust and small plastic particles.



3B PLACE

Place empty/clean net pots in multiple sites in the system.



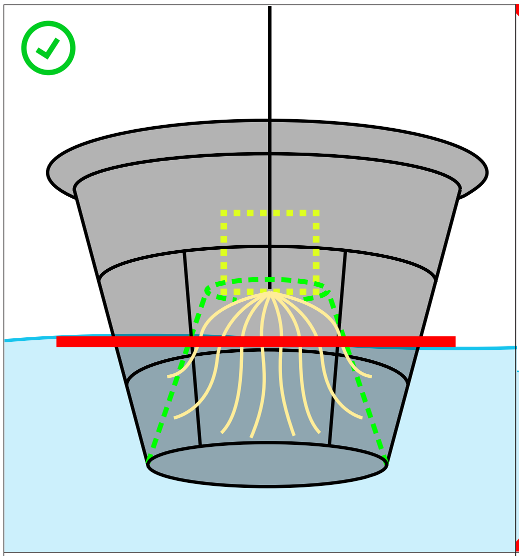
3C VERIFY

Verify that the individual bucket volumes are relatively uniform and that the operating volume is correct.

NOTE: Ensure the rockwool cube stays properly seated on the planting deck as the net pot is filled with media.

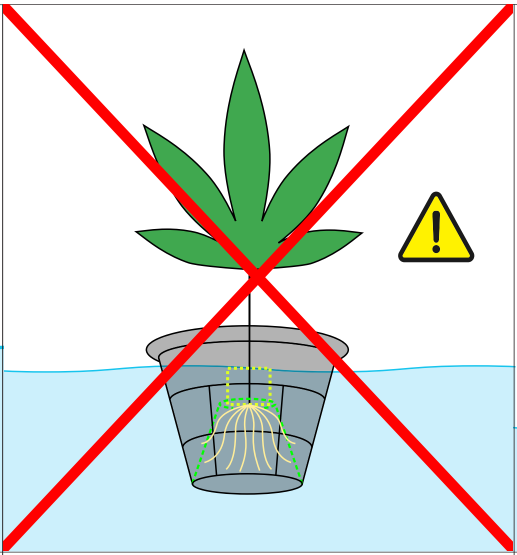
④ TRANSPLANT CLONES

WARNING: DO NOT PLACE FULL NET POTS ON FLAT SURFACES; EXPOSED ROOTS MAY BE CRUSHED OR DAMAGED.



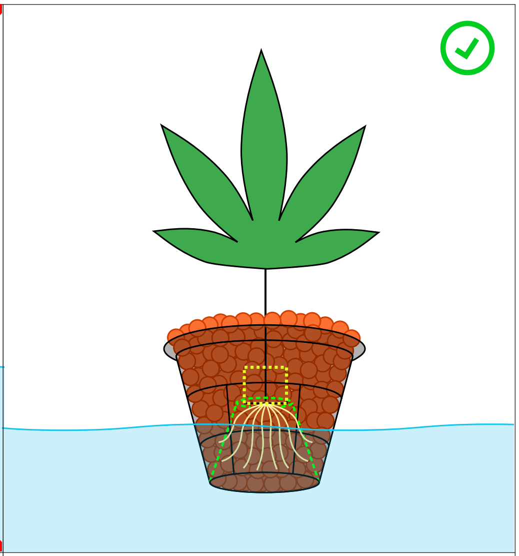
4A PLACE

Place the basal stem (or rockwool cube) on the planting deck, ensuring roots are positioned deeply.



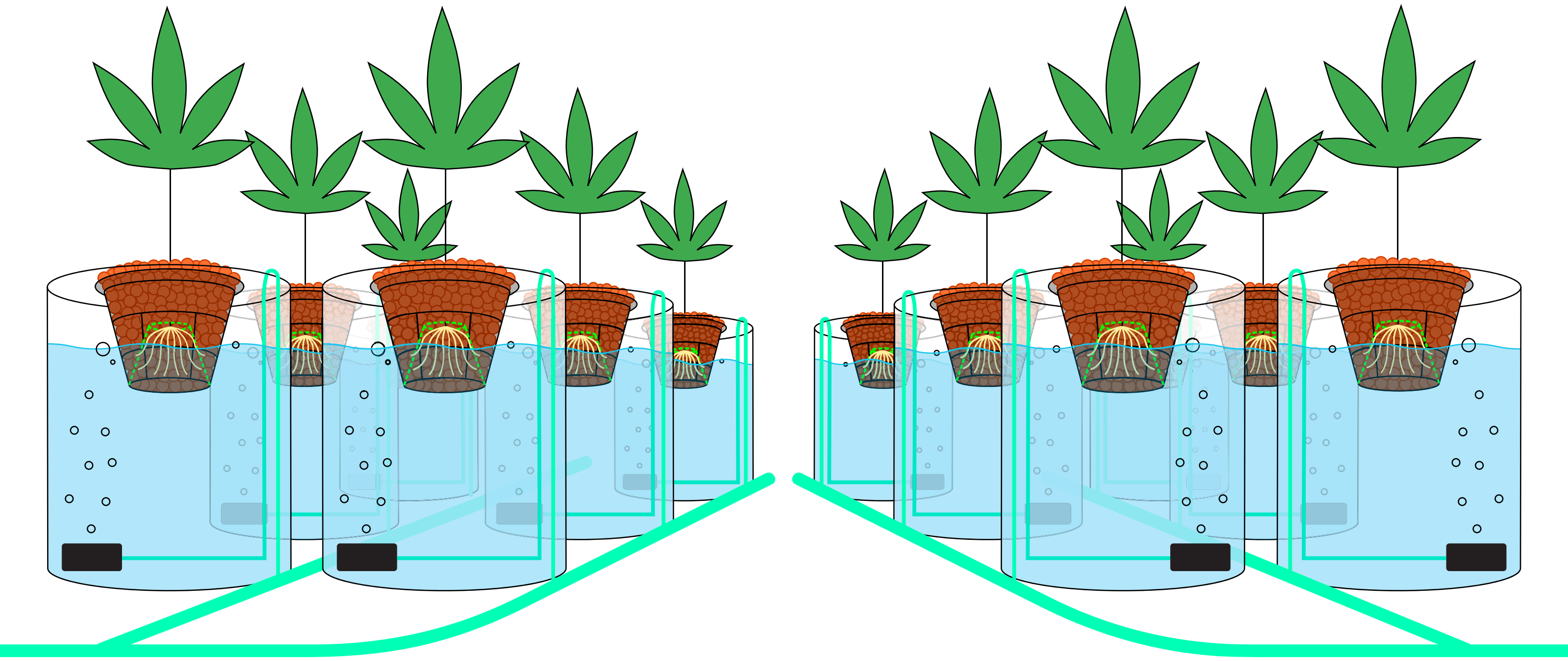
4B ENSURE

Ensure the basal stem and any rockwool are above the water line to prevent stem rot.



4C FILL

Gently fill the net pot with expanded clay.



VEG – ROOM ENVIRONMENT

Temp	25.6° - 27.2° C
RH	70%
VPD	0.8 - 1.0 kPa
PPFD	180 - 500

● LIGHT SCHEDULE

OFF / ON

6 HRS: **OFF** 18 HRS: **ON**

VEG – SYSTEM PARAMETERS

Water Temp	21.1° C
Air Pressure	6.5 kPa
PH	6.1 - 6.3
EC	0.21 - 0.67

VEG CONSIDERATIONS

Fewer Addbacks

Plants may not eat immediately. It may take up to 5 days to see plants eating.

Higher Nitrogen

Plants in the vegetative phase require higher nitrogen levels to support leaf and stem growth.

Long Light Periods

Provide 18 hours of light daily to encourage robust vegetative growth.

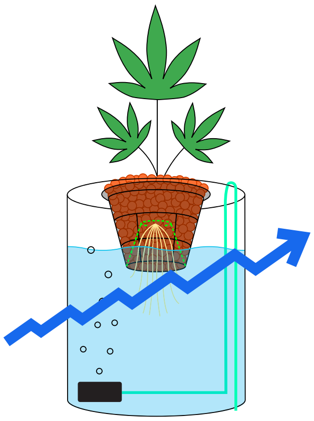
Training and Pruning

Apply low-stress training (LST) and topping techniques to control plant height and shape, promoting an even canopy.

CHANGEOUTS AT FLIP

VEG TIME: 2 WEEKS

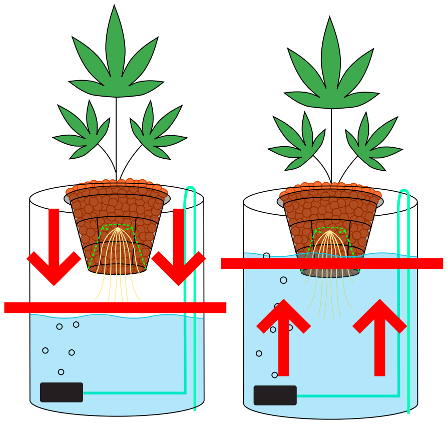
NO CHANGEOUT



Ideal for quick growth cycles, this option requires no nutrient solution change, saving time and resources.

VEG TIME: 3 WEEKS

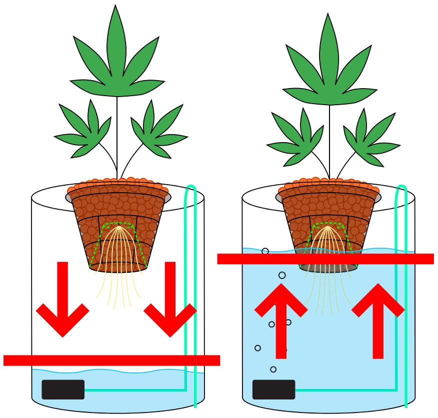
PARTIAL CHANGEOUT



Suitable for moderate growth periods, this option involves a partial nutrient solution change to maintain optimal plant health.

VEG TIME: 4+ WEEKS

FULL CHANGEOUT

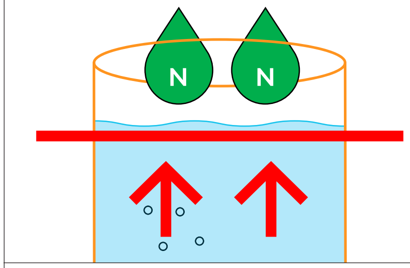


Best for extended growth cycles, this option requires a full nutrient solution change to ensure maximum nutrient availability and plant vitality.

NUTRIENTS AT FLIP

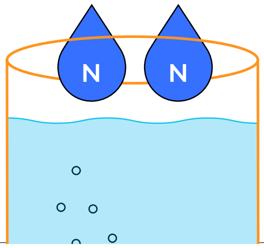
FLIP CHANGEOUT

Veg Nutes



DAY 1 ADDBACKS

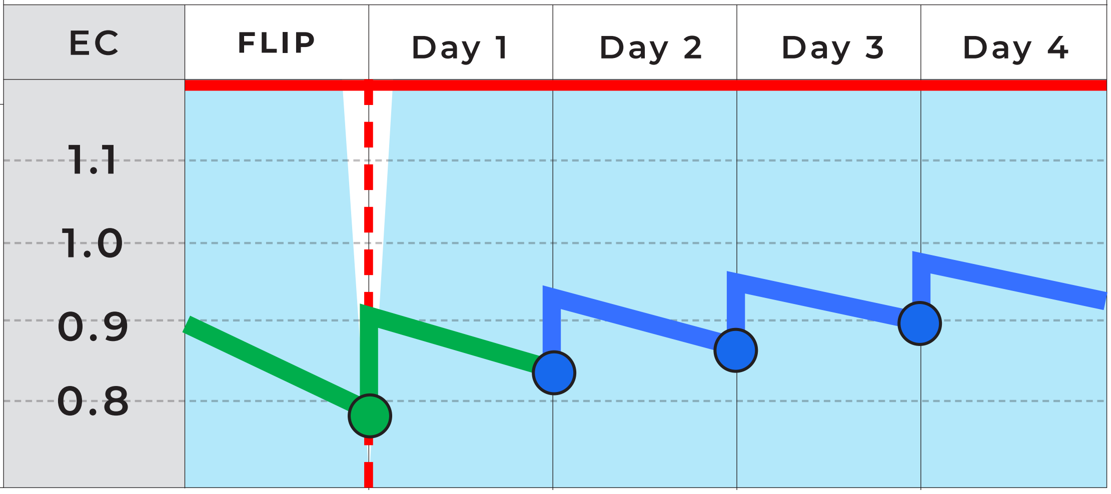
Bloom Nutes



WEEK 1 FLOWER

Chart shows veg nutrients being used at changeout and bloom nutrients used for subsequent addbacks.

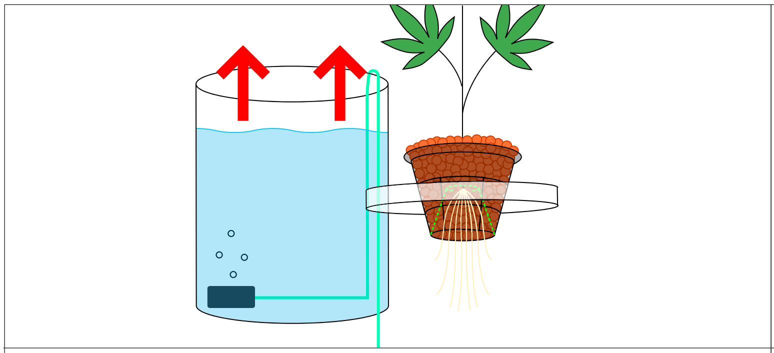
● Veg Nutes
● Bloom Nutes
- - Changeout
— Operating Volume



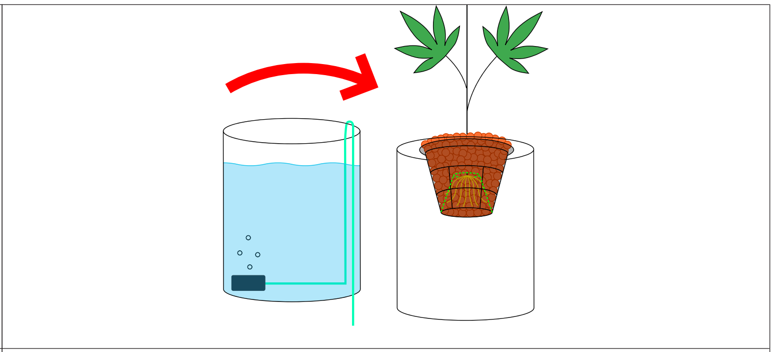
RDWC **TRANSPLANT**

If flowering in a different room than the veg room, use this procedure.

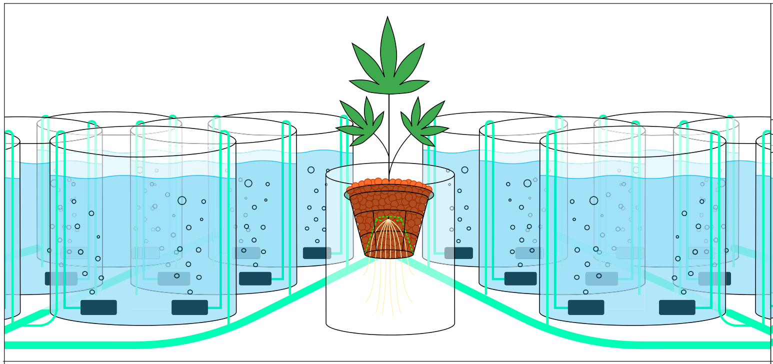
WARNING: HANDLE ROOTS WITH EXTREME CARE TO AVOID DAMAGE. DAMAGED ROOTS CAN LEAD TO STRESS, SHOCK, OR EVEN PLANT DEATH.



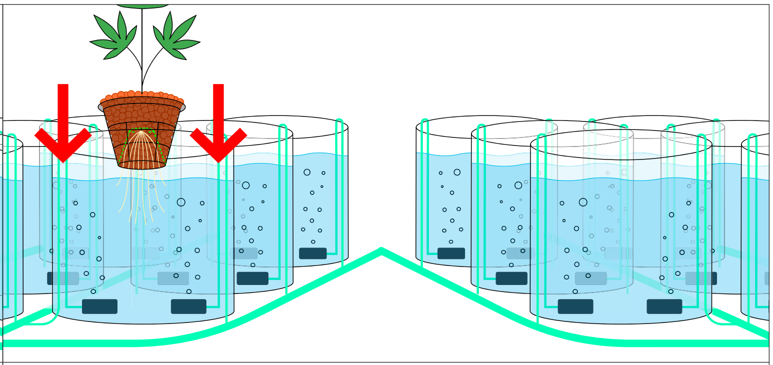
1. Pull the lid off and pick up the plant



2. Place into a clean 18.9 L bucket.

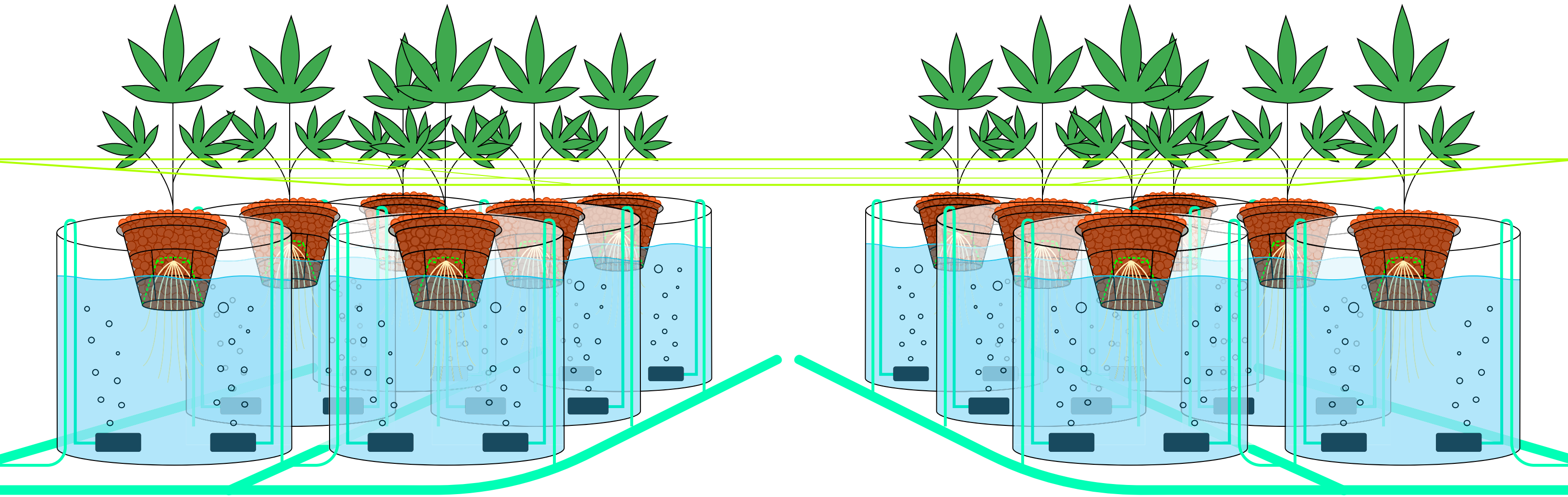


3. Walk over to the flower room.

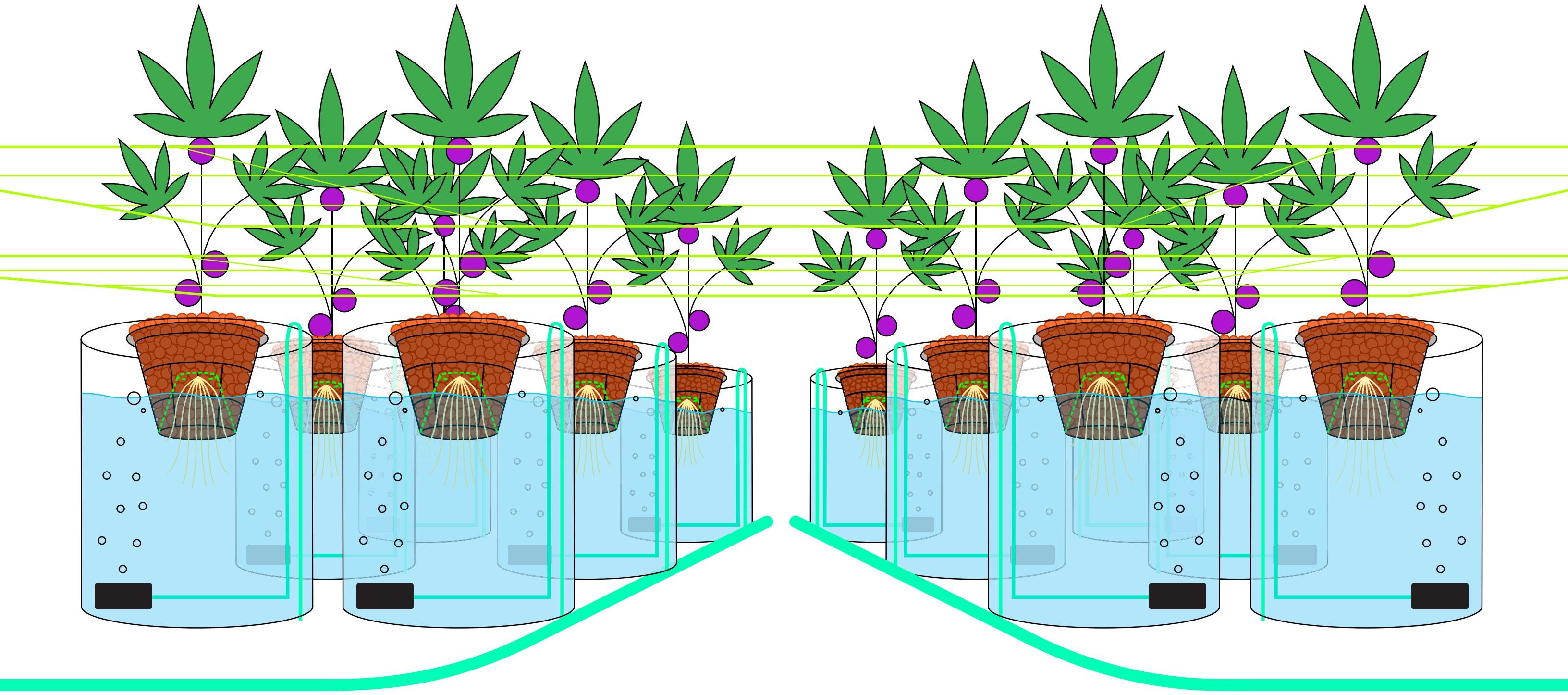


4. Place the plant into the 49.2 L flower bucket.

5. Repeat until all plants are transferred.



✓



FLOWER – ROOM ENVIRONMENT

Temp	26.1° - 27.2° C
RH	50 - 70%
VPD	1.0 - 1.2 kPa
PPFD	600 - 900

OFF ON

● **LIGHT SCHEDULE**

12 HRS: **OFF** 12 HRS: **ON**

FLOWER – SYSTEM PARAMETERS

Water Temp	13.9° - 20.6° C
Air Pressure	7.0 - 7.5 kPa
PH	6.0 - 6.5
EC	0.71 - 1.5

FLOWER CONSIDERATIONS

More Addbacks

Nutrient uptake increases in this phase, requiring more frequent addbacks to maintain optimal EC levels.

Higher Phosphorus & Potassium

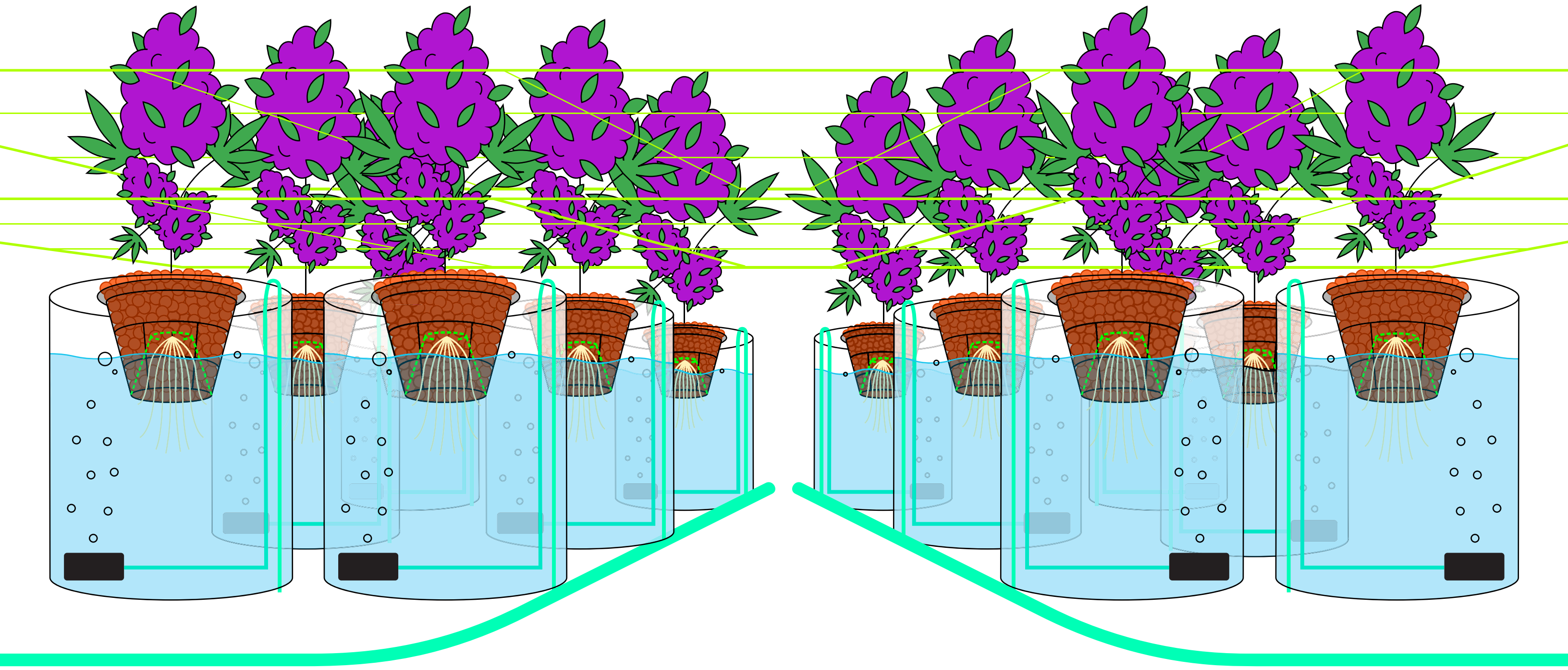
Shift to nutrients higher in phosphorus and potassium to support bud development.

Even Light Periods

Switch to a 12-hour light and 12-hour dark cycle to induce flowering.

Humidity Reduction

Lower humidity levels to prevent mold and mildew, keeping it around 40-50%.



FINISH – ROOM ENVIRONMENT

Temp	15.6° C
RH	40%
VPD	1.2 - 1.4 kPa
PPFD	800 - 1000

● **LIGHT SCHEDULE**

OFF ON

12 HRS: **OFF** 12 HRS: **ON**

FINISH – SYSTEM PARAMETERS

Water Temp	13.9° - 17.2° C
Air Pressure	7.0 - 7.5 kPa
PH	6.0 - 6.5
EC	0.0 - 1.0

FINISH CONSIDERATIONS

Minimal Addbacks

During this phase, nutrient uptake is minimal, so addbacks are rarely needed.

Final Flush

Perform a flush with RO in the last 1-2 weeks to remove excess nutrients and improve the final product’s flavor and smoothness.

Trichome Monitoring

Check trichomes for maturity, looking for a mix of cloudy and amber trichomes to determine the ideal harvest time.

Temperature Drop

Slightly lower the temperature during the dark period to simulate fall conditions, which can enhance color and flavor.

Renew Your Buckets

Irrigation buckets deliver critical nutrients to your crop. Biofilm and scale in your buckets can clog piping and airstones, giving inconsistent watering and nutrient delivery. Use **Athena® Renew** between runs to clean your irrigation lines, remove inanimate scale, and prepare the surface for application of disinfectants. For older dirty lines that have been used with organic inputs, you may need to repeat cleaning several times in order to clear all the inanimate organic particulates out of the lines. Follow the step by step procedure to renew your irrigation system with **Athena® Renew** and start clean every time.

Application Rates			
	Normal Cleaning	Heavy Scale /Biofilm	System Sterilization
Renew	7.8 mL per L	15.6 mL per L	
Reset			7.8 mL per L

Dosing Compatibility

Athena® Renew can be dosed into your control bucket with a Dosatron that is compatible with oxidizers. Other dosing systems require special seals such as Viton and Aflas that will allow them to dose acids or oxidizers.

Venturi based systems like Netaflex and Rhythm are not compatible with **Athena® Renew** and should be hand mixed into your reservoir after the injection system. Dosing by hand into your reservoir is the safest way to avoid problems with injection systems.

Renew
WATER LINE CLEANER & DESCALER
ATHENA

Athena® Renew

Reset
HARD SURFACE SANITIZER & DISINFECTANT
ATHENA

Athena® Reset

WARNING: MAKE SURE TO WEAR PROPER PPE WHEN HANDLING THESE PRODUCTS, INCLUDING GOGGLES, FACE SHIELD WITH RESPIRATOR, COVERALLS WORN OVER LONG-SLEEVED SHIRT AND LONG PANTS, SOCKS, CHEMICAL RESISTANT FOOTWEAR, AND WATERPROOF GLOVES.

CIRCULATION PHASE 1 – SOAK

❶ **Unplug**	Unplug the system's circulation pump.
❷ **Drain**	Open the drain manifold and completely drain the system. (If not fitted, drain with the recirc pump and/or sump pump.)
❸ **Remove**	Remove net pots and lids, being careful not to get debris or grow media in the buckets.
❹ **Prep**	Leave air blower / air pumps running / air stones attached.
❺ **Vacuum**	Vacuum the buckets out.
❻ **Remove**	Remove the inline filters, close the return manifold valve, and suck out the recirc lines.
❼ **Open**	Open the return manifold valve.
❽ **Filters**	Take the inline filters to the sink and clean them with warm water and a toothbrush. Hold them up to the light for inspection.
❾ **Replace**	Replace the filter/filters.
❿ **Fill**	Fill the system up to operating volume with RO water. (41.6 L per bucket for 49.2 L system, 24.6 L per bucket in a 30.3 L system. Include the control bucket in the calculation for total system volume).
⓫ **Reset**	Add 7.8 mL/L Reset in a few locations throughout the system.
⓬ **Remove**	Remove the add-back-kit from the control bucket.
⓭ **Vacuum**	Bring the vacuum to the control bucket and prepare to suck out any remaining old water/nutrient mix from the 2.5 cm corrugated recirc tubing when you start the circulation pump.

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⑭ **Pump**	Start the circulation pump and suck out 20 seconds of old water/nutrient mix. (Doing this will also help you prime the circulation pump.)
⑮ **Circulate**	Allow the system to circulate overnight with the air stones bubbling.

CIRCULATION PHASE 2 – SCRUB

⑯ **Unplug**	After sufficient circulation, unplug the system's circulation pump.
⑰ **Drain**	Open the drain manifold and completely drain the system. (If not fitted, drain with the recirc pump and/or sump pump.)
⑱ **Scrub**	Scrub the inside of the buckets, focusing on the waterline, support ribs, control bucket, air lines, and Drain-Out-Kit plug.
⑲ **Inspect**	Use HID lighting or a strong LED flashlight to inspect buckets after walls have dried for residual scaling.
⑳ **Vacuum**	Vacuum the buckets out with the air stones still on and bubbling.
㉑ **Remove**	Remove the In-Line-Filters, close the return manifold valve, and suck out the recirc lines.
㉒ **Open**	Open the return manifold valve.
㉓ **Filters**	Take the In-Line-Filters to the sink and clean them with warm water and a toothbrush. Hold them up to the light for inspection.
㉔ **Replace**	Replace the filter/filters.
㉕ **RO**	Fill the system with RO water to maximum operating volume.

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CIRCULATION PHASE 3 – REFILL

㉖ **Vacuum**	Vacuum the control bucket and prepare to suck out any remaining old water/nutrient mix from the 2.5 cm corrugated recirc tubing when you start the circulation pump.
㉗ **Pump**	Start the circulation pump and suck out 20 seconds of old water/nutrient mix. (Doing this will also help you prime the circulation pump.)
㉘ **Circulate**	Let the system circulate with the air stones bubbling for 20-30 minutes.
㉙ **Unplug**	Unplug the system's circulation pump.
㉚ **Drain**	Open the drain manifold and completely drain the system. (If not fitted, drain with the recirc pump and/or sump pump.)
㉛ **Fill**	Fill the system with RO water to approximately 2.5 cm above the bulkhead fittings
㉜ **Pump**	Start the circulation pump and suck out 20 seconds of old water/nutrient mix. (Doing this will also help you prime the circulation pump.)
㉝ **Circulate**	Let the system circulate with the air stones bubbling for 20-30 minutes.
㉞ **Unplug**	Unplug the system's circulation pump.
㉟ **Drain**	Open the back drain out manifold ball valve to drain the system to just below the bulkhead fittings. (If not fitted, drain with the recirc pump or sump pump.
㊱ **RO**	You are now ready to fill the system with RO water for the final time.
㊲ **Pump**	Once the water reaches desired level, turn on the circulation pump and vacuum out old water for 20 seconds.
㊳ **Nutes**	Add nutrients and pH to desired levels.

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METRIC

ATHENA® RDWC PROGRAM

BLENDED

In RDWC every feeding uses the addback procedure, even for the initial system fill. Since addback EC varies every time, the actual recipe is always different. The most important thing is to maintain ratios of products to keep mineral levels optimal.

Use the **Athena® Addback Calculator** to find the precise mL to hit your target EC for each week. Manual calculations use the below ratios and are discouraged due to potential errors.

FEED PROGRAM

All measurements are ratios as percentages, Cleanse mL/10 L

MIXING ORDER ↓	VEG					FLOWER								
	Initial	W1	W2	W3	W4	W1	W2	W3	W4	W5	W6	W7	W8	W9
Balance	*Use as pH up													
Grow B	30.8%	30.8%	30.8%	30.8%	30.8%									
Grow A	30.8%	30.8%	30.8%	30.8%	30.8%									
Bloom B						35%	36%	32.4%	30%	31.3%	26.1%	22%	22.2%	
Bloom A						35%	36%	32.4%	30%	31.3%	26.1%	22%	22.2%	
PK								16.2%	20%	25%	39.1%	53.7%	55.6%	
CaMg	38.5%	38.5%	38.5%	38.5%	38.5%	30%	28%	18.9%	20%	12.5%	8.7%	2.4%		
Cleanse	10.6	0.4	0.5	0.5	0.7	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
EC	0.21	0.26	0.33	0.50	0.67	0.71	0.93	1.07	1.21	1.36	1.50	1.36	1.29	Taper
PPM 700	150	180	230	350	470	500	650	750	850	950	1050	950	900	Taper
PPM 500	105	130	165	250	335	355	465	535	605	680	750	680	645	Taper

SYSTEM & ENVIRONMENT PARAMETERS

	VEG					FLOWER W1	W2	W3	W4	W5	W6	W7	W8	W9
pH	6.2-6.3					6.0	6.0	5.9	5.9	5.8	5.8	5.8	5.8	5.8
Water Temp	21.1-21.7° C					20.6°	20°	19.4°	18.9°	18.3°	17.8°	16.7°	16.7°	13.9°
Room Temp	25.6-27.2° C					25.6-27.2°	25.6-27.2°	25.6-27.2°	25.6-27.2°	25.6-27.2°	24.4-26.1°	22.2-24.4°	15.6°	15.6°
Air Pressure	6.5-7.0 kPa					7.0-7.5 kPa								
RH	65-70%					65-70%	65-70%	65-70%	65-70%	60-65%	55-60%	50-55%	40%	40%
CO_2	500					800	1200	1420	1420	1420	1420	1420	500	500

DISCLAIMER - This is a baseline recommendation. Any adjustments made are at the growers discretion. Adjust the feed chart according to weeks needed to complete a run. Strain dependent.

NOTE: RDWC EC is lower than traditional feeding programs due to the high volume of solution in constant contact with the root system.

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ATHENA®

RDWC **DAILY CHECKS**

BLENDED

Room:

Date:

ATHENA® DAILY CHECKS (All Systems)

System Volume	**Check:** Ensure water levels are consistent and at operating volume. Top off if necessary.	☐	☐	☐
System Temperature	**Check:** Verify water temperature is within the optimal range for plant growth phase.	☐	☐	☐
Circulation Pump	**Check:** Confirm the pump is operating correctly and there is good water flow.	☐	☐	☐
Air Pump	**Check:** Ensure the air pump is running and providing adequate oxygenation.	☐	☐	☐
pH + PPM	**Check:** Measure and adjust pH and nutrient concentration levels as needed.	☐	☐	☐
Discharge Valve	**Check:** Verify the valve is functioning properly and not clogged.	☐	☐	☐
System Smell	**Check:** Notice any unusual odors that might indicate problems like mold or algae.	☐	☐	☐
Meter Calibration	**Check:** Ensure all measuring instruments are properly calibrated for accurate readings.	☐	☐	☐
Leak Inspection	**Check:** Look for any leaks or drips in the system and fix them immediately.	☐	☐	☐

Notes:

🟩 Checked and OK at this time.

🟨 May require future attention.

🟥 Requires immediate attention.

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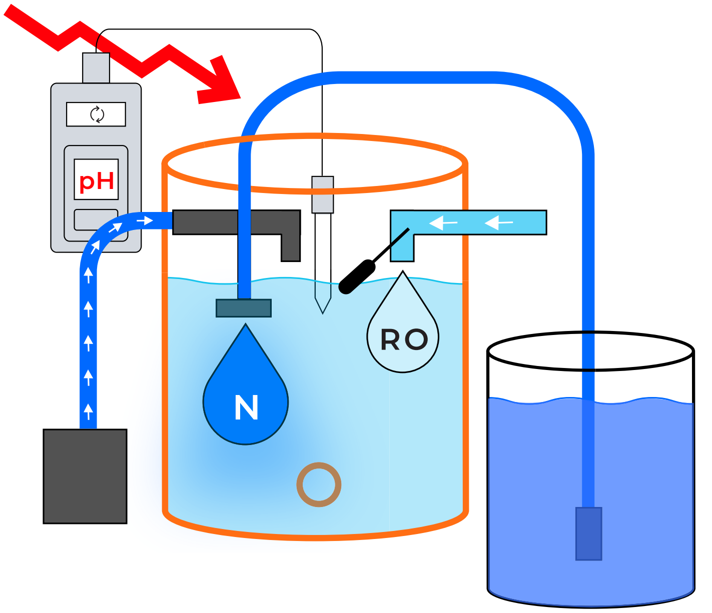
PRO TIP:

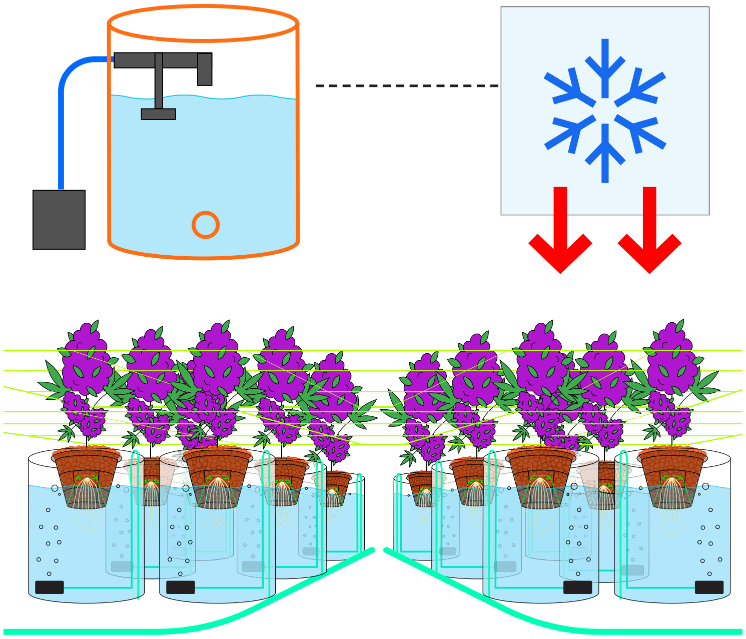
ADDBACK PH FLUCTUATION



pH is the most important parameter to adhere to. Note that pH may change rapidly after addback. Wait and then monitor because it will stabilize after inital push.

PRO TIP:

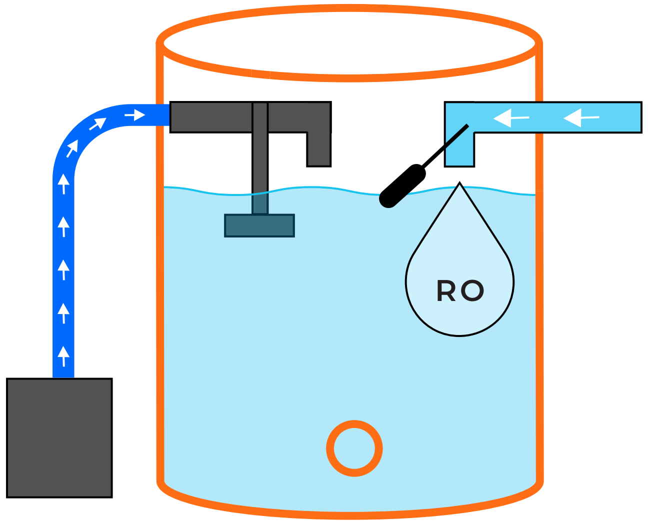
COLD FINISH



10 days before harvest, reduce the system temperature to 13.9°C to enhance plant colors. Note that temperatures below 16.7°C can reduce nutrient uptake.

PRO TIP:

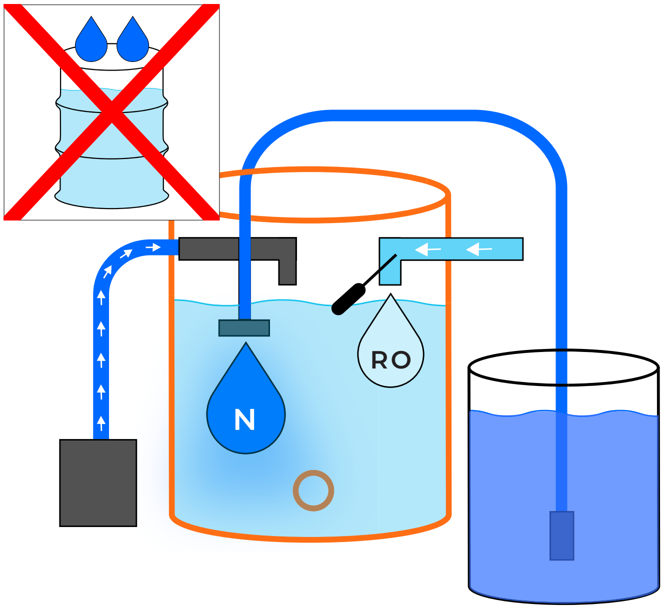
TOPPING OFF



Constantly top off systems with fresh RO water using a gravity feed or pressured manifold. Connect the float valve in the control bucket to the RO manifold to prevent fluctuations as plants drink.

PRO TIP:

BATCH TANKS



Don't use batch tanks for changeouts. Instead, we recommend mixing into an addback tank and feeding directly from the addback tank to the control bucket.

ATHENA®

CURRENT CULTURE H2O

SURNA

CURRENT CULTURE H2O

BLENDED

RDWC

RECIRCULATING DEEP WATER CULTURE PROCEDURE

METRIC

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